Network

Railways of Australia Quarterly

Volume 19, No. 4
Price: $2.50
December 1982, January, February 1983
ISSN 0159-7302

ROA

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Dramatic role for railways (page 41)
Picton project (page 49)

They're taking coals to Newcastle. . . and Readymix Farley lines the route

PROJECT: *Sandy Hollow Railway*
LOCATION: *NSW Hunter Valley*
ASSIGNMENT: *Quarry 650,000 tonnes of rock for rail ballast and concrete aggregates*
DEADLINE: *12 months*

Last year, Readymix won a $4.2 million contract from White Industries Ltd to quarry, process and deliver 650,000 tonnes of crushed stone and concrete aggregates for the rehabilitation and completion of the 'forgotten'* Sandy Hollow Railway in the NSW Hunter Valley.

When the Sandy Hollow to Ulan section is opened in October, 1982, the new rail link will enable large and increasing tonnages of high quality coal mined at Ulan to be transported to the Newcastle Coal Loader for export to Japan.

To produce such a volume of crushed rock in just twelve months is a tall order—even for Readymix Farley. Yet, already we are ahead of schedule.

But that's not surprising. As leading quarrymasters, Readymix and Farley & Lewers have been meeting contract deadlines for more than 30 years.

The Readymix Farley Contracting Division has established its versatile and large-scale Kangaroo mobile crushing plant at Bylong and currently it services two hard rock quarries in the area.

The Kangaroo mobiles each have a processing capability of 300 tonnes per hour and their design is the equal of any in the world.

For the Sandy Hollow project, the concrete aggregates were used in the construction of railway tunnels. Other crushed rock materials were earmarked for haul road construction, while rail ballast requirements totalled 600,000 tonnes.

**The Sandy Hollow to Ulan Railway was proposed in 1911 as part of a rail link between Dubbo and Port Stephens. Construction commenced in 1936 and continued intermittently until 1949 when all work on the project was suspended.*

"Very pleased"

Mr John G Kelly, Construction Manager for the Ulan Railway Project says:

"We have been very happy with the Readymix Farley performance on the Ulan project. They have produced acceptable products and have co-operated fully in ensuring that at no time was any section of the works held up by lack of production on their part."

The same team can meet your crushed rock requirements—anywhere in Australia.

When it's a job for the experts, contact our Contracting Division at
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Unley, South Australia 5061
Telephone (08) 272 1122 Telex AA 82640

READYMIX

FARLEY

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GM 82/59

Network

Railways of Australia Quarterly

Published by the Railways of Australia Committee, 325 Collins Street, Melbourne, 3000. Tel. 61 2545

Railways of Australia is an association of the government-owned railway systems, comprising: *Australian National • The State Rail Authority of New South Wales • Queensland Railways • VicRail • Westrail.*

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Qld.:	Terry Garry Media Pty. Ltd., 239 Milton Road, Milton, Qld. 4064. Tel. 36 7877. Telex TGM 43728
S.A.:	Market Media Associates, 79 McLaren Street, Adelaide, S.A. 5000 Tel. 223 6344, 223 6629
W.A.:	Wilson's Editorial Services, P.O. Box 40, Balga, 6061. Tel. (09) 349 5798

Contributions:

Articles, news and/or photographs (with captions) — covering any phase of rail activity are invited for consideration by the Editor, R.O.A. Network, 325 Collins Street, Melbourne, 3000.

Subscriptions:

Within Australia, $12 per annum (posted). Overseas, A$16 per annum (surface mail).

Front cover:

Internal view of the double-deck suburban passenger car under construction at Goninan's Broadmeadow plant outside Newcastle. The cars are part of a major contract for the State Rail Authority of NSW.

PRINTED BY LITHOCRAFT GRAPHICS, SOUTH MELBOURNE

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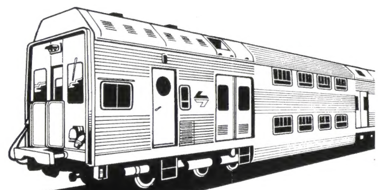

State Rail Authority of NSW

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VicRail

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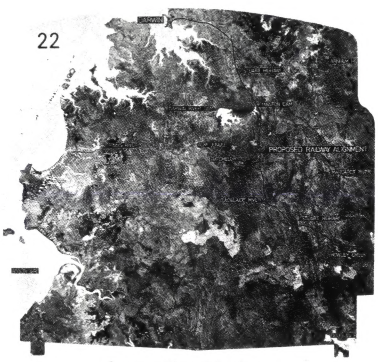

Australian National

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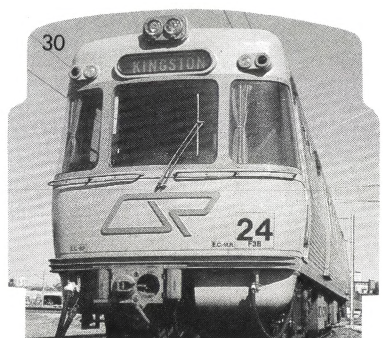

Queensland Railways

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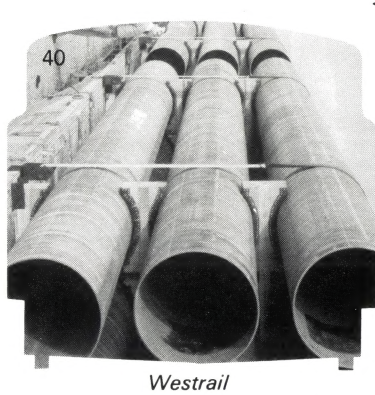

Westrail

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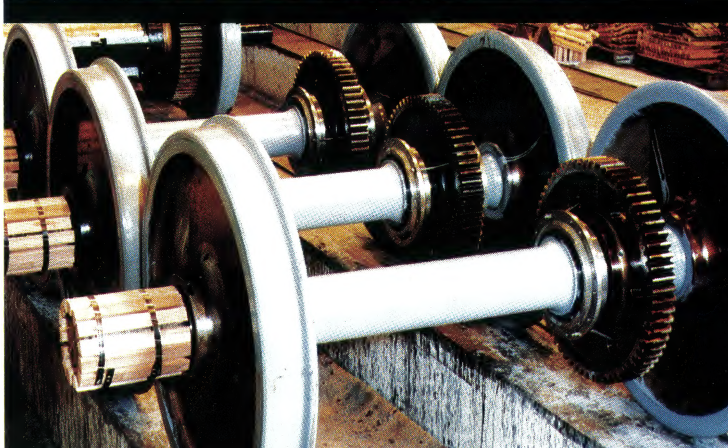
Intrans . . .

The conclusion of the Intrans article which commenced in our September quarter issue will be concluded in the March 1983 issue when the Intrans programme has been operating for some months.

Our only requirement of writers and personalities who contribute to Network is that they be informative or entertaining and that their subject has relevance to the wide interests of railwaymen today. Naturally, there will be occasions when their viewpoints or opinions run contrary to those of the editor or to Railways of Australia. We must accept that these differences are among the elements essential to the presentation of a lively and interesting magazine.


InterCity XPT
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The latest technology in diesel and electric traction

In both Sydney and Melbourne recently French Government representatives have screened colour films and provided considerable data on the evolution of the S.N.C.F's remarkable TGV high speed train.

French engineers acknowledge that the TGV's high speed record making performance does not detract from diesel traction in any respect. To the contrary! The latest technology in diesel engines is providing up to 45% efficiency in the conversion of oil into energy. In diesel development the only impediment has been not increasing the weight of the engine (and the locomotive) while still increasing the power, as axle loading is critical.

Engineers rely on two parameters to increase diesel power — increase of rotational speed and increase of torque. The former is governed by permissible piston speeds, 11 m/s being regarded as maximum before lubrication films break down and protection disappears, with consequent heavy wear on cylinders and pistons.

Torque involves introduction of more fuel. This makes the introduction of more air into each cylinder obligatory — so diesel engineers have turned to supercharging. These requirements have been directly responsible for the development of new techniques to cool supercharged air, to cool pistons internally, and also closed circuit pressurised general cooling systems. These techniques collectively can maintain reasonable operational temperatures.

Electric traction is also progressing rapidly on the world scene. In France for example over 80% of rail traffic runs on electrified lines. The advantages of electric traction are too well known for me to detail here — suffice to say reduced noise, lower maintenance, better performance and the cost effectiveness of electric traction have a timeless appeal to Railway Systems. The disadvantage is, of course, the high initial outlay. Generally speaking, electric locomotives require only half the maintenance considered desirable for their diesel counterparts.

Though the initial investment in electrification is substantial, its extra power can provide profitability in the long term for passengers and freight.

In Australia today we must plan for the future. Although the diesel form of traction will be with us for a long time to come, we should all be aware of the future for electric traction as we approach the twenty first century. Australia has the resources for power generation — and Australia has the know how. Let us keep open minds on world wide technological developments as we plan for the future in order to obtain maximum benefits from railway transportation's expertise on the international scene.

N. J. GAZZARD
EXECUTIVE DIRECTOR

N. J. Gazzard

Mr "Morrie" Gigney, Australian National Assistant General Manager (Operations and Marketing) recently addressed the annual seminar of the Tourist Travel Writers' Guild in Katherine, Northern Territory. Morrie's topic, and we record extracts of his subject here, was Railways of Australia with a particular emphasis on the Alice Springs-Darwin Railway.
A further article dealing with current work being undertaken to survey the Alice Springs-Darwin railway route is contained in this issue.
See pages 22 and 23

The Alice Darwin connection

This address has been entitled "Railways of Australia — Some Modern Trends", with particular emphasis on the Alice Springs-Darwin connection, or is it the Darwin-Alice Springs connection.

I lived in the Northern Territory for seven years and it did seem to me at the time that the world turned around Darwin and the further you lived from Darwin the less fortunate you were. In fact the mile posts then led from Darwin.

Therefore you were constantly aware as you proceeded down the Stuart Highway you were leaving modern Rome, and that the one and only highway led to Rome and that Darwin and Katherine isolated by distance were the centre of a civilisation and way of living yet to be fully appreciated by the world at large.

Clearly the advent of a modern railway will do much to rectify the state of affairs.

However, I must tell you from the outset it is not possible to deal in any precise way with the Alice Springs-Darwin line. Final arrangements have yet to be determined and they will need the approval of the Government prior to their application.

Our initial investigations into the potential for a new railway to Darwin did not give rise to a great deal of optimism. At that time the new standard gauge line to Alice Springs had yet to be opened.

Traffic on the old narrow gauge line from Marree to Alice Springs totalled 142,000 tonnes per year, of which 106,000 tonnes were distributed in the Alice Springs area and 36,000 tonnes were conveyed to Darwin.

Since the opening of the standard gauge route to Alice Springs the traffic has increased by 230% and now 310,000 tonnes are being conveyed to and from Alice Springs and Darwin annually. The main traffic is in road units conveyed by the Piggyback method.

The population of the Northern Territory is expected to be 167,000 by 1990 with 95,000 people in Darwin. By then it is expected that 136,000 tonnes of freight will be entering Darwin from

the South. "Total freight movement on Alice Springs-Darwin railway has been estimated at 600,000 tonnes by 1990. This envisages at least five freight trains of 3500 tonnes gross per week — with two moving through to Darwin.

The traffic to be generated by local industry encouraged by the presence of a heavy transportation medium cannot be assessed and the concept of a container Landbridge from Darwin to all of the southern and eastern states already mentioned in transportation circles may generate traffic in the southbound direction.

The passenger surveys conducted so far have identified strategies which may be adopted with the expansion of passenger services if a new line to Darwin is open and they will be of interest accordingly. The comments are my own and they should not be regarded in any way as an indication of government or Australian National policy.

In Australia it is possible to distinguish four (4) broad bands of travellers, namely, those who have money but suffer from time constraints, those who have little money, those who find it better to arrive than travel and those who find it better to travel than arrive.

Also we could divide travellers into two (2) categories, those who travel by choice and those who travel by compulsion. For these reasons we

perhaps find on the long distance trains a large number of people who have been freed from the compulsive necessities of the modern environment; people who like to see the world streaming past at ground level, rather than from eight kilometres above it and very often buried in cloud. We are finding a smaller but significant and increasing number of people who are finding perhaps that better decisions arrive from the five star hotel service provided on rail; and the relaxed atmosphere on rail is good for the stomach's sake as well as the wine.

It is clear that certain business people are finding that train travel is for conventions, for thought and consultation, and it is an end in itself and not a means to an end; and that travel for the sake of travel is a delightful thing not to be confused with a hectic state of motion where human beings are hurtled from office to conference room and back again in a short while much like a pea in a whistle.

Patrons of the sit-up services play cards, the guitar, they can walk around, have a shower and enjoy the refreshments on board; they do not suffer from cramp and swollen ankles.

Last year 1.6 million people travelled on the long interstate journeys by rail; of these 166,000 travelled over Australian National lines and of those 28,000 travelled to and from Alice Springs.

Every express passenger train in Australia has features and markets which are unique to that particular service. In view of the venue of this Conference perhaps the 'Ghan' is the most interesting express train to discuss as it may indicate the type of passengers likely to occupy an express train to Darwin in the future.

The 'Ghan' at present. The present 'Ghan' comprises 18 cars hauled by a GM locomotive. It has six sleeping cars, four sit-up coaches and eight service cars viz. including two lounges, two dining cars, a dormitory car for staff, a power van for electricity, and two brakevans. The total capital cost of this train at today's prices would be in the region of $15 million.

The train has a capacity for 320 passengers as follows:

First Class Sleepers	—	52
Economy Class Sleepers	—	92
Economy Sitting	—	176
		320

The capacity for sleeping passengers is limited to 144 by the dining car facilities which serve 48 passengers in each of the three sittings.

The 'Ghan' requires a total of 35 staff comprising conductors, catering staff and train crew and technical staff. The ratio of staff to passengers at 100% occupancy is 1 to 9.

The 'Ghan' runs between Adelaide and Alice Springs on a timetable of 23 hours 50 minutes from Adelaide and 25 hours 45 minutes from Alice Springs. It has a maximum speed of 110 km/h.

It has a large motorail component averaging 30 accompanied vehicles per trip comprising cars, caravans, boats on trailers, desert wagons etc which reflect the sporting, adventurous wandering nature of Territorians at large. Surprisingly motorail is used mainly by economy class travellers.

'Ghan' passengers fall into three main groups. Retired people make up about one third of travellers, one third are paid workers and one third are unpaid workers comprising among others, house persons and students.

Age grouping indicates that 61% of passengers are 45 years and older.

Currently almost 40% of passengers live in the Adelaide area and 60% in southern capital cities. Only 8% originate from Sydney and 14% from Melbourne which indicate large untapped markets for rail in the eastern states.

Only 10% of passengers originate in Port Augusta and the Northern Territory, which is a surprising thing.

While our biggest potential markets are Sydney and Melbourne, another large source of passengers could be tourists visiting Australia and using Darwin as their entry/exist port. A proposal being considered at present is a direct charter service from Sydney to Alice Springs in the winter months.

The 'Ghan' is predominently a tourist train with over 84% of passengers travelling on holidays or visiting friends and relatives. People are usually away from home for less than four weeks. Also 58% of people are travelling as a family group. Only 20% of passengers are on the 'Ghan' as part of a package tour.

The main initial destination of 'Ghan' passengers is Alice Springs. This applies to 46% of the passengers. 22% of passengers travel through to Darwin and a further 13% to other destinations in the Northern Territory.

Some 53% of 'Ghan' passengers seek accommodation on arrival at hotels/motels, caravan parks etc. 37% stay with relatives and friends. Another 29% have their own car for transport at destinations. The rest use local transport or they walk.

It is surprising to find that only 4% rent a car.

There are several reasons given by patrons for preferring rail to other modes of travel and the publication of some would not be in the best interests of intermodal harmony.

Overall rail patrons perceive the train to be more comfortable, or cheaper and with ready access to facilities offering creature comforts. The availability of motorail is a significant attraction.

On board entertainment is considered to be important by 50% of passengers, and 50% of passengers consider it important that the entertainment provided does not disturb them.

Many more consider quiet music to be more acceptable than films, video etc. although that is preferred to piano playing, singing etc.

There is an increasing irritation among non-smokers with smokers and non-smokers are on the increase.

The foregoing gives a thumb nail sketch of the present primary rail service to the Northern Territory. It is an interesting train of many facets and perhaps it could be classed as unique to South Australia and the Northern Territory.

The 'Ghan' has increased in popularity to such an extent that we have found it necessary to implement a 2nd 'Ghan' service, which may become a permanent feature.

When compared with the narrow gauge service which ceased in November 1980 patronage has increased by 176%.

The construction of a standard gauge link between Alice Springs and Darwin has been envisaged within a 10 year time scale and if it embraces that time span we could anticipate a far different type of train to Darwin than the present 'Ghan' service to Alice Springs.

It is reasonably certain that more than one train service per week will be justified to Darwin and Alice Springs and possibly there will be traffic for three. This service will require passenger cars providing accommodation for some 450-500 passengers per service. The cost of cars will be in the vicinity of $18 million. They would provide accommodation for 250 in coach class accommodation and 210 sleeping car patrons.

It is difficult to forecast at this point of time whether all of these trains would operate to Darwin. Developments in the Northern Territory in 10 years may indicate that we should continue to maintain a 'Ghan' service to Alice Springs to serve the centre and an

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extended service to Darwin on one or perhaps two days per week.

In such circumstances it is reasonable to assume that the 'Ghan' would continue to be the name of the particular train to Alice Springs.

I note with interest the name chosen as the result of a competition run recently. The 'Maluka' meaning Head Man or Big Boss Man is quite apt for a train which undoubtedly could become as internationally famous, perhaps more so, than the 'Indian Pacific', already the subject of many television documentaries by teams from England, Germany and Japan.

It's possible that a second Darwin service could be given another name such as Palmerston, Arafura or Carpentaria.

The Northern Territory has a multitude of names which relate to places and people, and people associated with its development and any one of which could be conferred upon the train.

Without doubt the name chosen will have a ring of adventure about it and this is appropriate to a train journey of over 3,000 kilometres from latitude 34 to latitude 10 traversing land from the lush fields and vineyards of South Australia through the arid stony deserts of the interior to the sub-tropical vegetation of the Northern Territory.

Travellers will pass on this journey in air-conditioned comfort through climatic conditions ranging from the mediterranean to the sub-tropical and are likely to see a range of vegetation and wildlife during its course which would be unparalleled on other train trips in this country.

The composition of the train and the characteristics of its passengers are likely to change also. Overseas developments have conceived trains far in advance of anything to be seen in Australia at the present time.

At the extreme range of sophistication we have the latest version of Japan's bullet train which will go into service this year on new lines connecting Omiyou with Morioka and Niiagata. This is an all electric train operating at top speeds of 260km/h. There is the Advanced Passenger Train of British Rail designed to travel at 250km/h and the French TGV designed to travel at 260km/h.

There is a great deal of technical data available on these trains and I hope that there will be no questions asked in that area. Suffice to say it is not likely that we will see this type of train in Australia in the next 10 years.

On the other hand it is not likely that we will purchase trains of the present conventional mould working with all purpose engines to travel to Darwin. It is likely that a new train to Darwin would incorporate elements of the XPT type of train based on British Rail design modified for Australian use over long distances in unfenced country.

The XPT has been recently introduced into New South Wales.

The XPT Inter-City Express is a high powered revolutionary train. It is capable of much greater acceleration, braking performance and speed than existing locomotive-hauled trains.

It provides additional seating for passengers when compared with older daylight services, and dramatically cuts journey times between country centres and Sydney. For example the third XPT which is in service between Sydney and Albury cuts 1 hour 22 minutes off the old Riverina Timetable, a saving of 20%.

The shells and underframes of the carriages are made from stainless steel which will ensure long life, low maintenance and a generally pleasing modern appearance. The train is fully air-conditioned with body-contoured deep cushioned seats, wall to wall carpeting and improved sound proofing.

Specially designed air-cushioned disc brake bogies give passengers a fast and, at the same time, a smooth and quiet journey. Other improvements are the automatic doors between carriages which make entry to carriages a lot easier, especially for passengers carrying luggage, and passengers returning to their seat after purchasing their meal in the Buffet Car.

The modified version will need to travel at least at 140km/h on a journey of 18 hours to Alice Springs and 36 hours to Darwin.

It is anticipated that the train will be equipped with a lounge for first class passengers, and a dining car and cafeteria/club car for the sit-up passengers.

Entertainment on board is likely to be multi-channel music, or comedy or a running narrative on the early exploration and history of the country through which the train is passing. Popular films, documentations etc on TV video will doubtless be screened. It is almost certain that a piano will be available in the first class lounge.

The characteristics of the passengers will undoubtedly change. Recent surveys show that younger age groups are being attracted to rail. Within the past 12 months there has been a 9% swing in favour of people under 45 and we believe this trend will continue as more and more young people discover the unique aspects of rail travel.

Managerial/professional people on the train are expected to increase in number to comprise some 30% of the travellers, at least a rise of 10%. The proportion of people classed as retired will continue to be a significant segment of the passenger complement.

The train to Darwin undoubtedly will be predominantly a tourist train. If current trends are followed 45% of the people travelling will be visiting friends or relatives and a further 42% will be on holidays.

We have given a great deal of thought to the scientific principles which should apply to a forecast assessment of the number of people who may travel to Darwin by rail in the year 1992. We feel this is a test more suited to a gypsy fortune teller equipped with a crystal ball and a great deal of luck.

By the most pessimistic forecast we anticipate a traffic of at least 60,000 passengers per year to Darwin which indicates at least two and possibly three trains per week to Darwin and excludes the 'Ghan' to Alice Springs. Of these 40% will stay in the Northern Territory for 1-4 weeks and 30% for 4-12 weeks.

With proper promotion and publicity the tourists should originate from all States with 20% from Darwin and some 15% from overseas. About 50% of travellers will be accompanied by their wife or husband.

It is likely that over 50% of train travellers will be seeking Motel/Hotel/Holiday Flat accommodation in Darwin. Some 5% of train travellers may rent a car upon arrival.

In view of the length of journey it is almost certain that motorail will be included on the Darwin train service.

The main reason why these people will have travelled by train will be that it was relaxing and comfortable. The expense of train travel will be of lesser importance and their perceptions of train travel will have risen appreciably by the journeys end.

Trends today indicate the operating characteristics of railways will need to change. The long held tenet that long fairly slow trains operated with maximum economies to a satisfactory reliability will assure a satisfactory level of traffic is now being challenged on convincing grounds that shorter faster dedicated trains that are both fast and reliable are needed to match the service requirements of a great deal of traffic susceptible to modal change.

New passenger information display system.

Innovations in passenger information display

The use of large and small sized letter in a graphics rather than a computer matrix font was a major innovation in the new country passenger information display system at the Sydney Terminal Station (Central) introduced by its designers GEC Digital, a division of GEC Australia.

Each large letter on the television display screens of the system takes up 64 of the 625 lines of the screen, with a small letter taking up 24 lines.

Four specially designed character generators provide 37 unique, separate and autonomous video channels, each with 512 x 512 pixels.

The GEC system includes such advanced text display features as proportional width, proportional spacing, overlapping characters and high resolution.

The display system replaced the 75 year old country train indicator board at the end of June, 1982.

The information display provides information on approximately 100 country train arrivals and departures each day at various locations throughout Sydney Terminal Station.

A feature of the design for the system is the use of well tried and tested standard off-the-shelf sub-systems and micro-processor board level products.

With video monitors, only necessary and relevant information need be displayed. The system provides easy reading for everyone within a reasonable distance of the screens.

The system uses monochrome signals and specially modified full colour video monitors. A selection of foreground and background colours can be chosen. At the Sydney Terminal Station white foreground and blue background were selected — the colours of the State Rail Authority.

Each display is indicated on one or more 66cm television monitors.

Twenty of these are combined in pairs to display ten train departures complete with train stopping patterns, departure times and platform numbers to form the main indicator, located in the centre of the railway concourse.

One monitor at this location also provides a summary of train arrivals.

At the entrance to each of the fifteen platforms at Sydney Terminal Station, a monitor summarizes the expected train departure or arrival times for that platform.

Summary arrival information providing estimated and scheduled times and departure information are also displayed in the public lounge, booking hall, escalator and taxi ranks.

All monitors will automatically display information controlled by a computer which has access to timetable data.

Also information including special messages may be manually inserted into the programme where necessary.

The system at Sydney Terminal is similar to those already installed in five Melbourne underground and aboveground stations by GEC Digital.

The Melbourne system uses a variety of foreground and background colours on the display monitors to make train routes more easily identifiable.

Other features of the system include:

- The elimination of the need for air conditioning in the equipment room.
- The use of customised software for operator control.
- Ruggedised video monitors in sealed housings suitable for harsh environments.
- The duplication of principal control equipment providing simple changeover if failure occurs.
- The use of ordinary mains power circuits.

GEC began the work for the contract in July, 1981 and completed the project in June, 1982. GEC's contractual scope included complete design, software, manufacture, installation and commissioning.

Sub-contractors for the project were AWA Rediffusion for the television system and Housley Computer Communications Pty Ltd for the timetable software.

Leonora Line Upgraded

Westrail has completed the upgrading of the Kalgoorlie-Leonora railway.

The completed work will now enable Westrail to haul heavier tonnages in each wagon and at improved track speeds.

The railway between Kalgoorlie and Leonora was initially built at the time of the gold rush and was constructed in two sections. The first extension, built between Kalgoorlie and Menzies, was completed in 1898.

As more discoveries of gold were found further north the line was extended and reached Leonora in 1903. Built to a minimum standard the narrow gauge link service the region through the gold boom, the two world wars and the depression.

The discovery of nickel in the mid 1960s saved the railway. For up until then the tracks had deteriorated, gold had lost economic significance and the traffic over the railway had declined to a point where closure was imminent.

The nickel concentrates from Western Mining Ltd's Windarra nickel site brought a 200 000 tonne annual cargo on the Leonora-Kalgoorlie railway.

In 1972 Westrail commenced upgrading work to convert the narrow gauge link to a heavier standard gauge line. The conversion was necessary to meet with the increased mineral tonnages and to link with the Kalgoorlie-Kwinana standard gauge railway.

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SRA pushes ahead on 5-year plan

The New South Wales Minister for Transport, Mr Peter Cox recently released details of the capital expenditure of $308 million announced in the Budget to continue improvements to the State Rail Authority System.

Mr Cox said the Government had honoured its commitment to the second five year programme of investment in the upgrading and modernisation of the rail network which was costing a total of $1,400 million.

In the current year, the $308 million would be spent on:

- new suburban and interurban carriages;
- the purchase of new "super" locomotives and wagons to move the State's huge coal production;
- extra XPT units;
- track extension, rebuilding and strengthening;
- rebuilding of bridges and signalling;
- upgrading passenger facilities, including new commuter carparks and refurbishing stations.

Mr Cox said under the year's programme 50 new double-deck cars would be added to the suburban fleet at a rate of almost one a week.

This programme would cost $30 million and at the end of the financial year the number of double deck cars in use in the metropolitan area would total 721 or two thirds of the metropolitan fleet.

In addition, $20 million was to be spent on new double-deck interurban cars. To meet the rapidly increasing numbers of Blue Mountains and Central Coast commuters 20 cars would be delivered and orders were being drawn up for another 80 interurbans to serve the Wollongong area when electrification was completed.

Mr Cox said these interurban carriages, which were airconditioned and provided a high level of comfort were the best commuter trains available anywhere in the world. The fleet would total 86 at the end of the year.

The Minister said $15 million was being provided for additional XPT carriages to meet the expected increased passenger demand during the year and to be used on the Armidale and Canberra XPT services when they were introduced. Provision has also been made for financing the refurbishing of older country rolling stock under the SP2 programme.

Freight fleet. A total of almost $100 million was being spent on expanding the State Rail Authority's freight fleet and facilities. Most of this expenditure is to serve the rapidly expanding coal haulage.

A total of 150 new locomotives were on order of which nearly 50 would be delivered during the year.

They included 20 new 81 class "super locomotives" — the most powerful ever used in New South Wales — which were being obtained for bulk coal movement.

The number of coal wagons will be doubled at a cost of $40 million, Mr Cox said.

More than $30 million was being spent on track strengthening and rebuilding to cater for heavier coal trains. Concrete sleepers would be used on a major scale for the first time in New South Wales and the rebuilt track would provide a smoother ride for passenger trains as well.

He said maintenance of wheat lines which were used mainly for the movement of the year's crop would cost another $21 million and the Government had agreed to proceed with this work despite the reduced production as a result of the drought.

In the metropolitan area work would proceed at a cost of $7 million on:

- quadruplication of the line between Granville and Westmead;
- duplication between Gymea and Carringbah;
- extra track facilities north of Hornsby.

Electrification. Expenditure on electrification from Wyong to Newcastle this year would amount to $23.5 million with completion due in 1984. The project was employing 150 staff and work currently in progress included track improvements, erection of overhead wiring and building of substations.

Mr Cox said electrification works for Waterfall to Wollongong and Port Kembla would involve another $25 million. Because of earlier uncertainty in Federal-State funding arrangements, the project may not be completed until 1986.

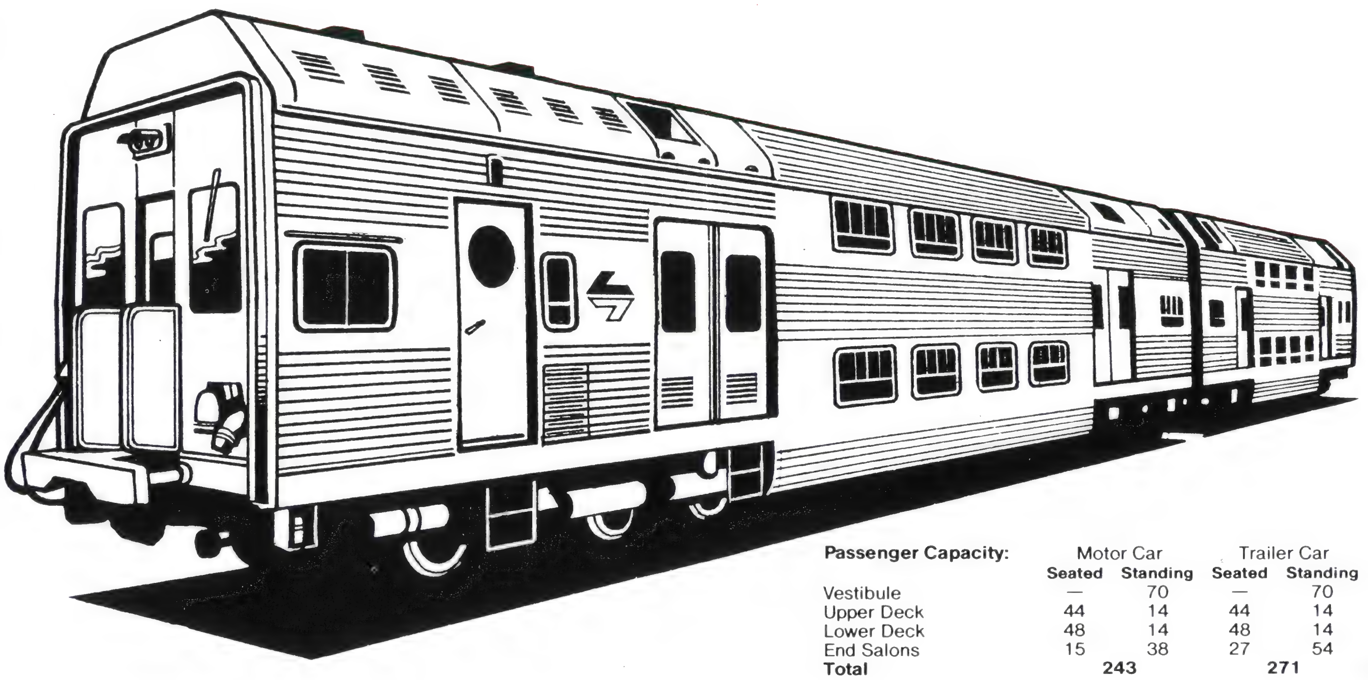
A new station would be built south of Campbelltown and electrification would extend to that point.

Other works. Mr Cox said the rebuilding of signalling and communications would cost another $30 million and the replacement programme involving work on 50 bridges a further $7 million.

An extra 1500 parking spaces would be provided at stations by the addition of new commuter car parks in the metropolitan and interurban areas.

In addition, 100 railway stations would be upgraded and refurbished. Another $1 million would be spent on expanding facilities at country freight centres.

$308m to be spent in current year



Passenger Capacity:	Motor Car Seated	Motor Car Standing	Trailer Car Seated	Trailer Car Standing
Vestibule	—	70	—	70
Upper Deck	44	14	44	14
Lower Deck	48	14	48	14
End Salons	15	38	27	54
Total	**243**		**271**	

No delays in 'double decker' deliveries

More than two hundred double-deck suburban carriages manufactured by A. Goninan and Co. Limited, Newcastle have been handed over to the State Rail Authority of New South Wales.

This Company is currently manufacturing a 100 double-deck suburban carriage order for the State Rail Authority through a $60 million contract.

To comply with the first contract for 200 carriages Goninan's were required to deliver two carriages a week. This meant that each month a new eight car double-deck set costing $5 million was placed in service.

Ten carriages in this order were air-conditioned and these were currently in use to evaluate their efficiency under suburban operating conditions.

The remaining 90 were equipped with fan assisted heating. Already 42 of these carriages, forming seven six carriage trains, were in use. This provided a vast improvement in passenger comfort during cold weather.

Commenting on the success of the Double Deck carriage aquisition program NSW Transport Minister Mr Peter Cox said the Goninan Stock was performing superbly.

Mr Cox said an eight car double-deck train seats 896 passengers. "This is an increase of 336 seats or 60% more than on the eight car single-deck train," he said.

Passenger comfort has been specially considered in the design of these carriages.

"The carriages have air-suspension for a smoother ride and are fitted with forced draught ventilation which gives a complete change of air each minute."

The doors were power-operated and the windows glazed with anti-glare and heat-reflecting glass.

Mr Cox said the new carriages were being fitted with public address systems to enable communication between the guard and driver and the guard and his passengers.

"This development is an extension of the State Rail Authority's policy to keep passengers fully informed in regard to train irregularities and other matters of interest to passengers. Existing double-deck carriages are also being retro-fitted with PA systems. Already 174 of the 359 older double-deck carriages have been converted," he said.

Rail transportation

Goninan has been involved in the manufacture of rail transport equipment for over 50 years. Mainline, branchline and industrial shunting locomotives, passenger rail cars, freight bogies, bulk hoppers and other specialised freight rolling stock are built for both Government authorities and private companies.

The majority of diesel-electric and electric locomotives are built under licence to General Electric Company, USA. Goninan does, however, manufacture locomotives to other designs; a series of 1150/1000 hp AC/DC diesel-electric locomotives were built under an agreement with Hitachi Ltd, Japan.

Goninan is also a recognised Australian designer and manufacturer of freight rolling stock. Units for transporting coal, wheat, petrol, wine and many other bulk materials are manufactured to a wide range of specifications, either as one-off items or in large production runs.

The most recent Goninan venture in rail transportation is the manufacture of suburban passenger rail cars. A technical assistance agreement with Pullman Standard, USA, has enabled Goninan to benefit from the considerable expertise of this prominent company.

With the acquistion of a new division in Taree, NSW, Goninan now has capacity for the manufacture of freight bogies. The bogies, in fabricated steel, are built to British design under licence to Gloucester Railway Carriage & Wagon Co. Ltd.

Goninan's expertise in rail transport products, built up over many years of manufacturing, is supported by its modern engineering design facilities. Through the company's engineering consultation service, two-way communication with the customer is provided for the vital process of working out and analysing his exact needs and requirements.

The latest methods of working with different materials are taken account of thoroughout the detailed planning stage and strict quality control is maintained during all phases of construction.

Major transport revamp for Victoria

Transport in Victoria is set to undergo a dramatic and challenging transformation. It will include one of the most significant management restructuring processes ever to take place in the public sector of that State.
The changes will restructure a Government transport administration that directly employs more than 32,000 people and operates with an annual budget of around $1,600 million.
The changes, to take place on July 1, 1983, have the co-operation of all groups involved in transport.
Consultation is taking place at all levels within the transport industry, including transport users, unions and management.
During the first six months of office the Minister of Transport, Mr Steve Crabb, has announced many new and often long overdue projects. After years of cutbacks and neglect, Victoria's transport system, particularly the railways, is being improved and expanded.
The existing transport authorities were set up under their own separate Government Acts. These authorities are the Victorian Railways Board (VRB), the Melbourne and Metropolitan Tramways Board (MMTB), the Railway Construction and Property Board (RCPB), the Melbourne Underground Rail Loop Authority (MURLA), the Country Roads Board (CRB), the Transport Regulation Board (TRB) and Road Safety and Traffic Authority (RoSTA). The functions of the West Gate Bridge Authority were taken over by the CRB on July 1, 1982.
The Acts defining each individual authority's often narrow and conflicting responsibilities have often maintained the rigid independence of the transport bodies, especially through their direct access to Treasury for funds.
From July 1, 1983, the seven existing authorities will cease to exist and four new authorities will be created. These are The Metropolitan Transit Authority (MTA), the State Transit Authority (STA), the Road Construction Authority (RCA), and the Road Traffic Authority (RTA).
Each new authority will be set up along modern corporate management lines, will be co-ordinated by, and responsible to, a Victorian Transport Directorate chaired by the Minister of Transport.
This will enable co-operation rather than competition between the various modes of travel.
The MTA will operate all metropolitan rail passenger services, trams and tramway buses, will contract with private metropolitan bus lines and regulate taxis. It will take over the metropolitan functions of the VRB, MMTB, RC&PB and MURLA.
The MTA's task will be to draw together Melbourne's public transport system into a single co-ordinated unit. It will be Australia's largest single public transport operation.
The STA will be responsible for all country passenger services and will operate all freight and ancillary services, and at a later date will be responsible for ports and harbours. It will take over responsibility for country functions of the VRB and RC&PB and become one of the nation's major transport organisations.
The RCA, in conjunction with the Municipalities, will be responsible for the maintenance and construction of the road network.
The RTA will be responsible for road safety programs, traffic management, driver licensing, vehicle regulation and the education of road users.
Each of the new authorities will be responsible for its own financial management, will have the power to borrow funds, be able to enter into contracts, develop its own land and property and be able to tender for outside work.
The Boards of each authority will be representative of management, employees and transport users.
Regional committees will be formed to advise each of the Authorities directly of problems, solutions and necessary improvements. These committees will include representatives from users, employees, regional management and local government.

'New and long overdue projects to proceed'

● *A gleaming new trainset and modern underground station on Melbourne's City Loop.*

Victorian transport directorate. The Victorian Transport Directorate (VTD) will act as a corporate management group for transport.
It will be chaired by the Minister of Transport, and include the Director-General of Transport, the heads of each of the four new authorities, a Director of Planning for the Ministry and a representative from Treasury.
The role of the VTD is to provide a balance between the overall total transport needs of the Ministry and the individual operational needs of the authorities, offsetting the need for imaginative policy development, against the financial and operational realities.
It will provide a total transport-wide perspective in policy development, allocate funds in accordance with pre-determined priorities and monitor the effective use of those funds by the authorities in their pursuit of Government objectives.
The Ministry of Transport is being restructured to provide an efficient support to the VTD. It is headed by the Director-General of Transport, the most senior management position in the Transport Portfolio.
The Chairman of the VRB, Mr Alan Reiher, was designated to this position on August 25, 1982.

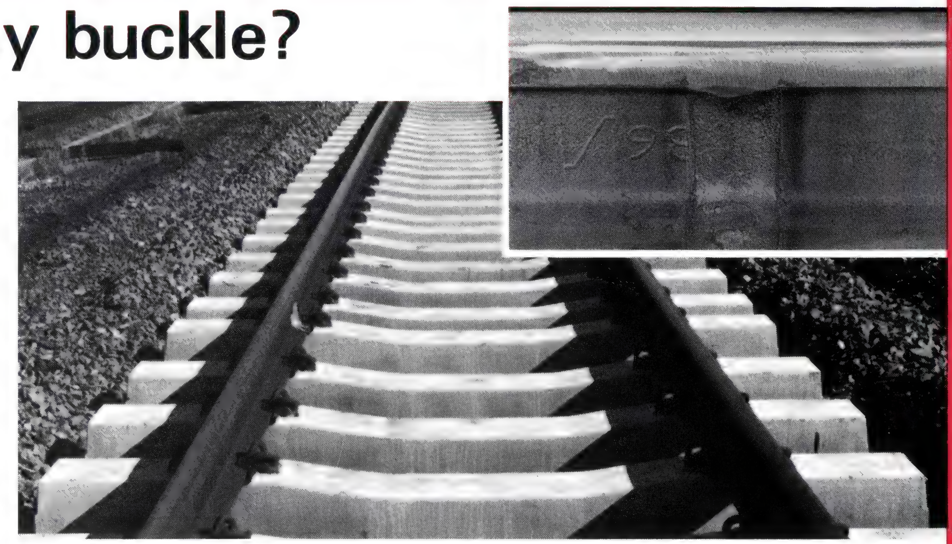
1983 Transport plan. Concurrent with the 1983 restructuring process, a 1983 Transport Plan is being developed in consultation with the various groups involved in transport. It will be a five-year rolling plan of transport programs and projects and will seek to establish the broader transport policies for the rest of the 1980s and beyond.

Why don't they buckle?

Recently Hume News published articles giving details of the THERMIT process for welding rail lines to provide a continuously welded rail (CWR). This has prompted questions from readers "Why don't they buckle?" The ambient temperature range in Australia from a cold frosty winter's night to a hot blistering summer's day is about 0° to 38°C (32°-100°F) in many places.
Before an explanation is given of the methods used for controlling rail movement over any temperature range, perhaps first, there should be a discussion on why we weld rails at all.
For decades we've all understood that the clickety-clack of the carriage wheels over the rail gap is something we must accept in order to permit free contraction and expansion with temperature changes. We were once fascinated by the Wheel Tester, at stations, tapping carriage wheels for flaws and cracks.

Heavier and faster trains. Since World War II, competition from road transport, railways running at a loss, a skimping of funds including less maintenance monies, plus advancing technology from overseas research, forced railways to rethink just what was their future and where savings could be made.
Economies could be made with faster and fewer trains and heavier axle loads and this led to a study of the existing track system to cope with the heavier demand and desire to reduce maintenance costs. The existing track system was not satisfactory for these new and evolving conditions.
Adoption of new techniques by Australian Railways, both Government and private, was the result of exhaustive research, tests, calculations and detailed experiments over many years by several leading countries including Australia, where heavily loaded mineral railway lines were experiencing wear patterns which were outside the normal parameters.

Continuously welded track. One of the areas where cost of maintenance could be reduced, life of the track system greatly extended and safety improved is in an improvement of the track structure.
Capital investment in the track system and formation is a fixed overhead and is a major part of railway investment even when compared with investment in rolling stock and engines. Thus it is in the track system where considerable development work has been and is still being concentrated.



● *Continuous THERMIT welded rail on concrete sleepers (final run of ballast yet to be placed). Inset: A completed THERMIT rail weld.*

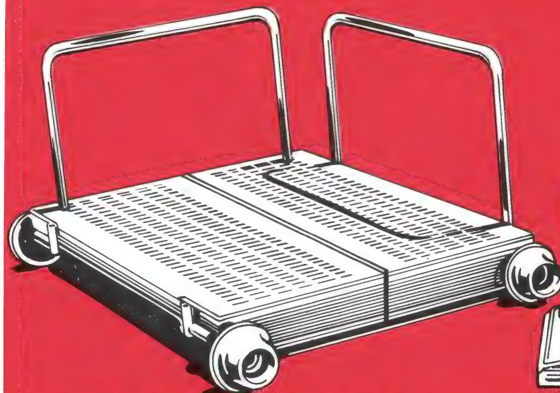
This article is reprinted in Network with kind permission from Hume News

Designed not to buckle. Continuously welded track on substantial sleepers and ballast with adequate fastenings has many advantages over the old 10m long dog spiked fishplated wooden sleepered rail, provided vertical, lateral and longitudinal forces including those due to temperature changes can be satisfactorily accommodated with the track system.
Under these new service conditions the fishplated rail joints and timber sleepers were showing up fractures and other weaknesses proving them to be unsatisfactory.
Techniques are now available so that these forces can be contained. Space does not permit a full discussion of and the mathematical proof for this but comment on the key factors will interest readers.
Most new or replacement rails are flash-butt welded into long manageable lengths in the workshop and taken out on flat top cars (137m or 500ft. for the new Alice Springs line). These are then laid and fastened to the sleepers and THERMIT welded together. The temperature of the rail at field welding is critical and is called the 'neutral' temperature, that is, the mean of the minimum and maximum rail temperatures experienced.
Gap size at welding must not be greater than a predetermined figure.
Creep resistance to the movement of the rail over the sleeper has to be of sufficient order to prevent rail breakage and buckling. Thus the bedding and fastening system must be adequate.
Ballast stone, grading, size and ballast shape, depth, width and compaction are critical elements and it is now done mechanically. This must guarantee sufficient longitudinal and lateral resistance against movement of the track in the ballast bed. In other words much greater attention must be initially given to ballast consolidation.
Basically, the critical force of buckling for CWR can be split up into three components.

- The proportion of the Euler-buckling load of the rail being approximately 12-15% with a small variation due to wear of the rails.
  (Euler-buckling load depends on the slenderness ratio of the rail between supports, and is a function of the shape and area of rail cross section and rigidity of fastenings.)
- The proportion of the rail fastening resulting from the torsional resistance. This is approximately 15-30%, depending upon the upper ratio condition of fastening.
- The proportion of ballast resistance. This is 55-70% depending on ballast, width of ballast and ballast compaction.

From these it can be seen that the ballast resistance represents the greatest proportion of stability and that the first two components can only be increased either by means of a stronger rail cross section or by stiffer fastenings of the track.

Conclusion. The above discussion only touches on the solution. There are many other factors such as rail wear, corrugations, rail stress and deflection, foundation material, wheel rail contact stresses, sleeper bending stresses, etc., all or many of which are interwoven with track stability.
Thus, we conclude that Continuously Welded Rails are safe and do not buckle if properly designed, installed and maintained.



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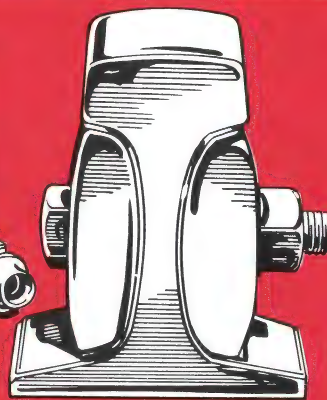

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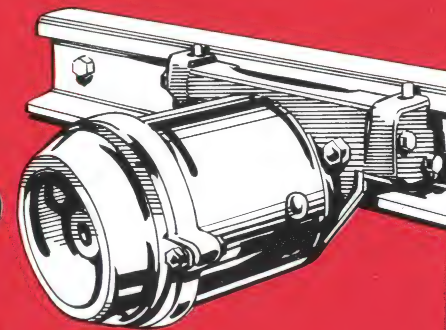

PORTEC CURVE LUBRICATOR
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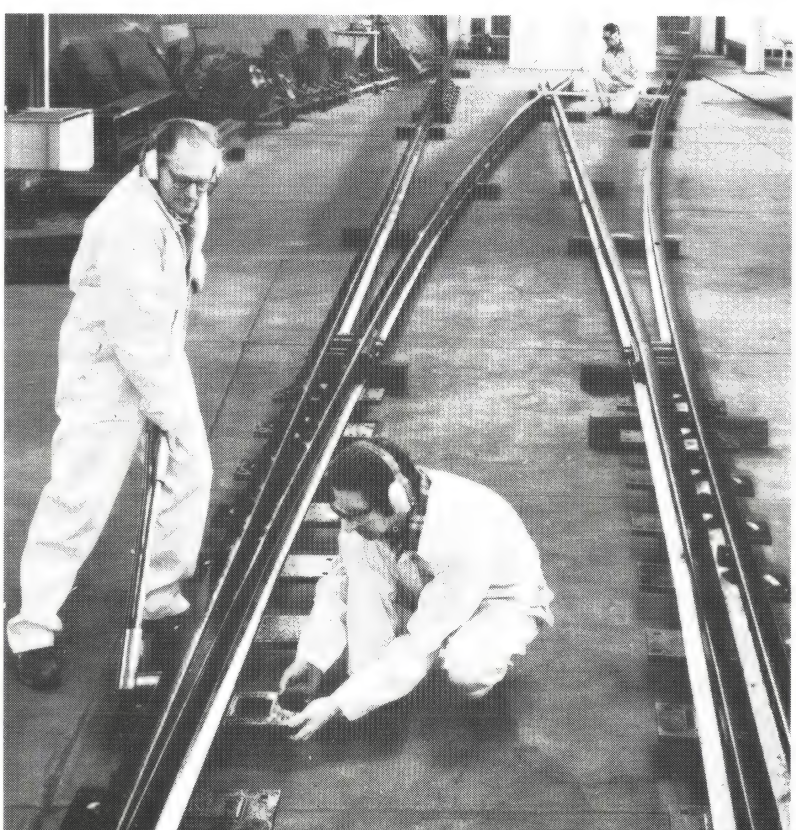
Portec trackwork equipment shunts across to Thompsons-Byron Jackson.



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dwell.....

In our September quarter issue of Network our second article in a series of four relating to urban systems dealt with peaks and rush hours. In this issue, our special correspondent examines two critical areas in the rapid movement of rail passengers, 'dwell-time and headways'.

By a special correspondent

System Capacity Increases. In our first article we saw how the track capacity of a suburban railway was fixed by seven inter-related factors. These reduced in essence to the number of trains per track per hour, and the number of people per train.

It can be shown by laborious calculation or computer simulation that once beyond the traditional 'one mile an hour per second' or 1.6km/h/s, raising the acceleration performance of the train is an increasingly less profitable pathway to line capacity than two far simpler and cheaper options. The first is to cut station stop time or 'dwell', and the second is to provide what is (in terms of today's technology) a relatively simple signal system needed to achieve a theoretical 90 sec headway.

This statement will surprise people who may have hitherto imagined that very advanced technology is needed to feed trains across town at the rate of 24 per track per hour, but the fact is that train densities of this level were attained on electric railways in England and America long before 1910. On the Old Great Eastern Railway running into London's Liverpool Street Station they were even attained into a dead-end terminus, operating with steam traction.

The proof of this thesis can be seen every peak hour on the Sydney City Railway, where special signalling arrangements devised before 1926 provide a theoretical 90 sec headway, and assure reliable operation of a 2½ min service despite variable station dwell times of up to 45 seconds (the normal maximum on a subway system is twenty seconds, and really busy lines try to keep it as low as fifteen).

The Sydney equipment allows following trains to "close up" to those ahead and proceeding at very slow speed, to enter a platform almost immediately after the last car of the preceding train has cleared it.

This is achieved by a 'speed-checking' system that provides full automatic safety protection against the driver's inadvertently over-running signals. The signal system was originally conceived some 60 years ago, and it is the acme of simplicity.

It uses no computers or electronic devices — nothing, in fact, more elaborate in principle than a timing relay to prove the speed of the approaching train and, if that speed is consistent within a safe braking distance, to allow the train to move a little closer to the tail of the preceding train (the system fails safe, too). The train-stop device is a simple mechanical trip arm raised by a gravity counterweight and electrically or pneumatically depressed only when the line is clear. The arm engages a tripcock on the leading left-hand axlebox directly under the drivers cab, and if the train overruns a danger signal the trip arm strikes the tripcock, which blows-down the automatic air brake to initiate an irrevocable full emergency-brake application.

A 'control governor' or air pressure switch prevents the driver from reapplying power and restarting his train before he has enough brake air pressure to stop. The speed-timing device prevents the driver from applying full power, and charging into the train ahead.

Hence there have been no accidents on the Sydney City Railway since the first section opened 56 years ago — a truly wonderful record. The same basic protection is also provided on the newer Eastern Suburbs line, and can be

selectively installed at other key points where trains are prone to queue, e.g. on approaches to key junctions or stations known to be subject to long platform delays.
Elsewhere, conventional automatic signal blocks approximately three quarters of a kilometre apart provide adequate capacity for the suburban service densities around Australian cities. And Sydney's protection system is not unique: in every suburban electric system in this country, if a driver totally ignores **any** danger signal he will automatically be stopped before he can run into trouble.
What the 1926 equipment did not do was to report the presence of all trains to a single office, thus providing for the effective, centralised traffic-regulation needed to take the sorts of complex decisions previously described. Nor, since it relied on signal-post telephones, did the 1926 concept assure really effective controller-to-train driver communication. But in the vital business of safely moving trains down a busy track, the three basic ingredients of track circuit, automatic 'block' signal separation of trains, and train-stop protection against overrun are almost as old as electric rapid transit itself.
They are entirely adequate for Australian train densities whether the signals are semaphores, colour lights or the latest overseas techniques of a continuous cab signalling display.

More Capacity: Tracks or Trains? Having raised the trains per track to a practical limit the only other way to move trains is to provide more tracks. The cheapest — which really means the least expensive — way is to add a third track to a 2-track route, and to signal it for reversible working according to the total flow of the morning or the evening peak. This expedient is being, or has been, applied to open up several bottle-neck sections in Melbourne, Sydney and Brisbane. If the express track is laid between the all 'stations' tracks with a Y junction at each end conflicting movements are minimised, and overtaking by fast trains is possible, speeding up service to outer suburbs.

But it is important to note that no total route capacity improvement will be attained unless the triple-track section extends the full length of the bottle-neck, e.g. from terminal to first diverging junction or turn-back point, and the peak is short enough to avoid the need to work the empty trains back over the remaining counter-flow line. But as that is the kind of peak found on Australian lines, the third-track option is usually a valid one.
Given that the limit of the line capacity has been reached, the only way to move more people is to raise the load per train. One option is to stretch the trains, and as the main-line expedient of drawing up twice is totally unacceptable in urban work, this means lengthening every platform.
This is not merely a matter of extending the platform brickwork and dirt fill 30m or so each way on every station: it usually involves relocating siding and junction trackwork, major signal alterations and possibly rebuilding public road bridges. Such exercises are formidably expensive.
The cost is such that lengthening platforms at city underground stations is just not on. As part of the current Brisbane electrification, however, the short platforms on the South Side lines could be brought up to the North Side standard of 158m to allow the full capacity of QR's standard-length electric and stainless steel diesel-drawn trains to be utilised.
Interestingly, the difference between standard suburban platform lengths in Sydney, Melbourne and Brisbane is only 3m — despite the three railways' having had completely different car lengths and train composition.

Dwell. Dwell is the total time spent by a train halted at a station. In an age of inertial navigation and space flight, working a suburban train through a station stop seems an awfully mundane transport operation, which indeed it is. But it is nevertheless one of the most critical aspects of suburban rail system performance and indirectly, of peak-hour commuter comfort. For station working not only involves specific steps taken in sequence by trained railwaymen, it depends on the co-operative behaviour of variable numbers and densities of passengers, some of whom will not be 'trained' commuters familiar with the system.

When the train pulls in, the guard must initiate release of the power doors. If he times this so that the doors are already sliding apart just as the train actually stops (which some railways' rule books rather quaintly forbid) initiating door-opening will save an extra 0.5 sec; power-operated doors will themselves take about 2 sec to open. If doors are passenger-operated after the guard has initiated door release, opening can take longer while the inexperienced passenger fumbles with the button or catch-handle control.
There are greater delays if the passenger must physically wrestle the door open, and still longer delays if the door sticks — which is why the busiest systems opt for full power operation of every door at every stop. The passengers then leave and others board the car, which takes by far the longest time at critical city stops and interchange stations; we will examine its implications later.
Then the porter must blow his whistle, check the platform and only if all are clear, flag the guard; this takes typically 2 sec. The guard must react, make a second safety check, and operate his 'door close' button which takes most of another second.
The doors must close and the guard must check that no part of anybody — literally, of any body — is trapped in them befor he rings the 'right-away' to the driver (motorman), who must react to the bell, release his electro-pneumatic brake, and switch on power.
All of this may sound tiresome (on a long trip, it is) and obvious, but if you analyse it you will find that staff operations alone can take up to 10 sec per station stop.
Door-engine performance is important, but human performance is even more

HEADWAY HEADW

so. Consider, for example the scope for creating cumulative delays when our 24 peak-hour trains are worked across town, on the busiest track through six busy city stations (a condition already common in Sydney and Melbourne).

No less than 288 stop operations are involved through the 2-hour peak on this track alone. Let one station officer in six take an average of five seconds instead of two to whistle a train out, and he will have cost the last train almost 2½ minutes.

The same proportion of guards with slow reactions will likewise cost the peak another 2½ minutes and, having not advantageously timed their door releases, such people will also have failed to save any lost time. But the passengers' behaviour matters even more. Each stop is as slow as the slowest doorway, which means the slowest or most obstructive passenger. We can forgive disabled folk and Grandmas travelling during the rush with two bags, a parcel, and an off-peak ticket.

Less tolerable are the selfish commuters who block exits, clog the platform around the doorway, and don't know about 'Standback and Let Car Off'. Such passengers often cost their fellow passengers 10 sec per station stop. The cumulative effect of this selfishness on the peak is most serious — it can easily cost 10 min. And often does.

Such people could usefully be instructed in the error of their ways by their fellow passengers with stiletto heel or pointed umbrella. On our busiest lines every 2½ minutes lost is 600 to 1,000 comfortable seats that just do not run. On a bad day, the factors listed above can easily cost the peak a totally unnecessary delay of 15 minutes or 6 trains, and while in practice the inbuilt resilience of the system and alert staff would more commonly reduce the loss to only two or three trains, the result is still the same — fewer seats, more crowding of standee space, and reduced punctuality.

Door Conditions. While the basic performance levels of staff, train equipment and passengers will set the basic performance of the system, the flow conditions at key stations will also influence it. The issue is simply one of how many people want to get off and onto the train. Here it is worth noting that if 40 people enter, or all 40 leave a car vestibule, the total time they take will be much less than if 20 enter and 20 leave, which will be less again than if 15 enter and 15 leave past a residue of 10.

It is here that the basic difference in role between Australian suburban railways and overseas Metros becomes important. Our city railways are essentially distributors and collectors of suburban commuters, and not metro replacements for the cross-town tram or bus. In Brisbane, for example, most commuters travel directly to or from Central, and not Roma Street or Brunswick Street.

In Sydney, almost 40 percent arriving in town from lines other than the Eastern Suburbs choose to detrain at Wynyard in the morning but, because they tend to shop after work, may entrain elsewhere on the way home. In Melbourne, Flinders Street and not Spencer Street is the busy downtown terminal, although the Underground Loop is designed considerably to reduce Flinders Street's popularity — and the peak-hour congestion on its platforms.

Consider the practicalities of working a heavily-laden Sydney 2-decker from the South or West after it picks up its last citybound commuters, and pulls out of the fast suburban platform at Burwood around 08.00, with 1,200 souls on board. Up to 75 travellers will expect to use each doorway to get out. The vestibules, which under football-crowd conditions of crush can carry over 40 people, will on average contain up to about 10 standees.

As distribution is not uniform some will contain up to 15, with perhaps five more standees in the adjoining saloons (few choose to stand in the aisles of the 2-deck portion). When our train arrives at Redfern, typically six people will push their way out through a verstibule initially containing 10-15; at Central, typically 15 will move out past a residue of 6 in the vestibule.

At Town Hall typically 18 will detrain through a vestibule that is now sufficiently empty for those remaining in it to move over to the non-platform side of the car, well clear of the flow. At Wynyard, typically 27-30 will detrain, leaving only 10 people or so in the car to cross the bridge to North Sydney.

These 27 people will detrain under ideal conditions, through a near-empty vestibule onto an empty platform, where few if any will be waiting to join the train for North Sydney. 30 seconds will usually see them all safely clear, ready for the porter to flag the train out — even though Wynyard High Level is the busiest railway platform in Australia.

In Melbourne, an inbound train will unload its people through 21 vestibules (7-car blue train) or 18 vestibules (6-car Silver or Orange train). If very crowded, from 45 to 55 people may need to exit through each pair of doors at Flinders Street. But here again, virtually all are unloading onto an initially empty platform and 45 sec or so will comfortably see them all off.

The problems arise at the intermediate junctions and interchange stations where, in the peak hour, a number will both detrain **and** entrain through packed vestibule areas. The location of station exits planned 90 years ago often compounds this by concentrating the crush. But as Australian systems are oriented to the central business district, such trouble spots are relatively few. In Sydney, for example, there are a few problems varying from train to train at Town Hall, Redfern, and Strathfield, and around the factory and school knock-off time, further west at Lidcombe, Granville, Liverpool and Paramatta.

It is not too Irish to say that if Wynyard was located where Redfern is, the

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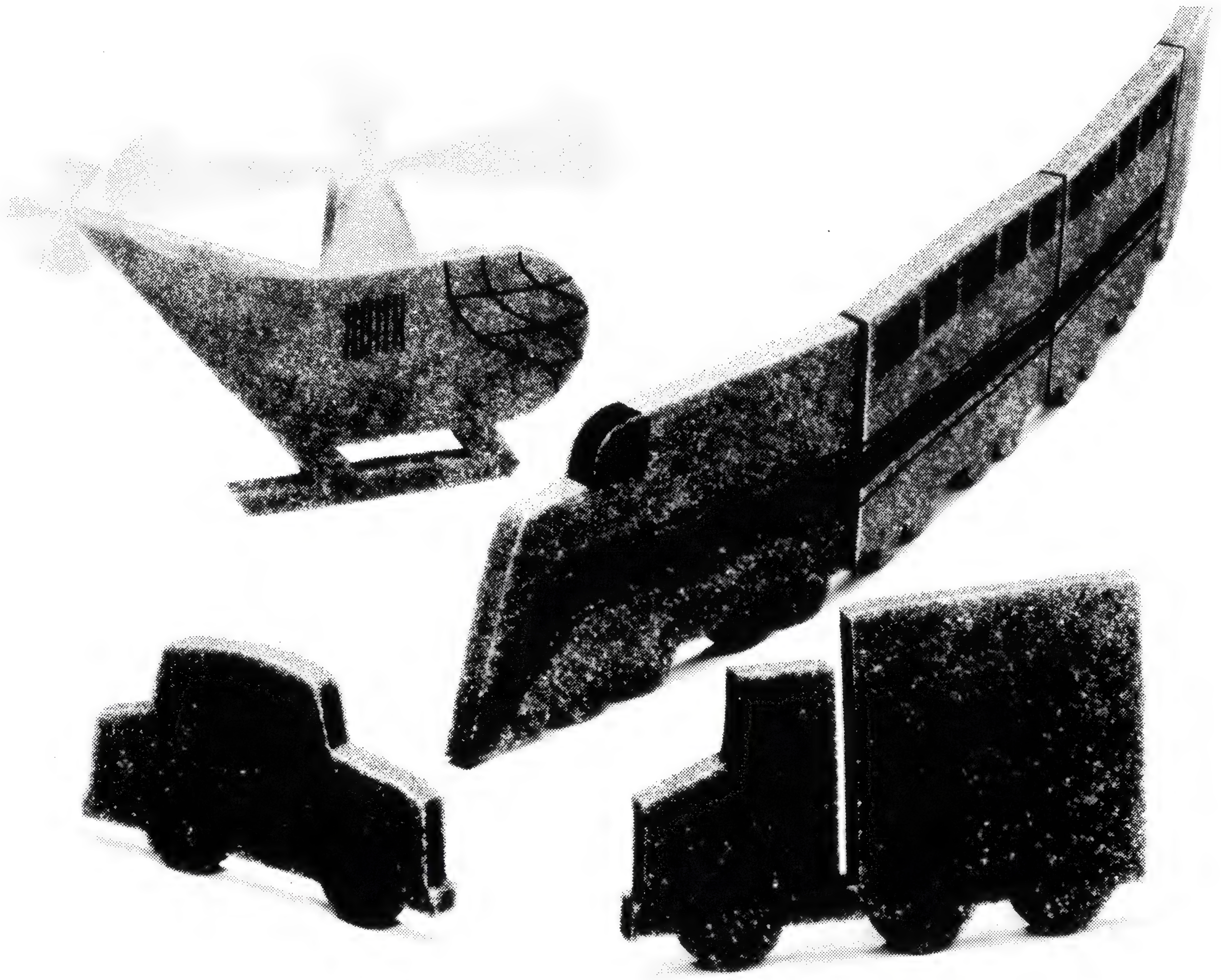

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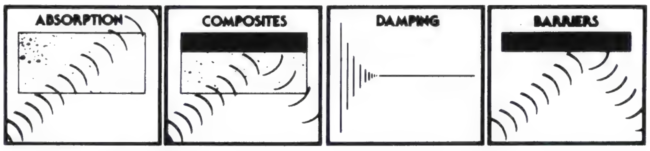

NYLEX CORPORATION LIMITED

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continued from page 19

Sydney railway system would probably need a quite different kind of electric train with much bigger door openings and more standee space. Sydney would also have a faster evening than morning peak*.

All dwell problems are compounded by cancellations, usually due to crew shortages or delays, due to equipment failure, or industrial problems. This is because most of the commuters will push into the first delayed stainless steel train to arrive. If our inbound 2-decker from Burwood, for example, has 1,600 and not 1,200 aboard — and such a load is getting closer to its absolute-maximum, worst-crush capability — the vestibules will contain not 10 to 15 but 35 to 40 people. 33 percent more passengers would have to fight their way out at Redfern, Central, and Town Hall in station stops as long as 50 sec.

Up to a minute will be dropped, further delaying the following trains and compounding the problem.

Overseas Metro cars are designed to cope with crowded vestibule conditions such as these as a matter of routine, despite closer stops and frequent interchange with other lines.

They have more doors and less seats; only rarely do Metro cars have fewer than four double-door entrances per car. The long Hong Kong cars carrying 300 people per coach have five.

Car Design Influences. The biggest influence on "dwell" that the train designer can exert is his arrangement of the doors, vestibules, aisles and in 2-deck cars, the stairways. Usually a high performance is attained from two-by-two entry through power-operated bi-parting leaf doors, giving a clear opening of around 1,300mm, to a vestibule uncluttered by staunchions.

To help keep standees back from this opening, transverse partitions should be set back typically 700mm. A door wider than 1,300mm, does not really pay off unless it is a full stream of people wider — say 2,000 or 2,100mm — permitting three at a time movement. This implies a very large vestibule indeed — and large doors that take 50 percent longer to open and close.

A very careful layout of the grabrails is also needed to assure safety, in case people are thrown against each other in the large vestibule or, on the rare occasions when door-engines fail and a door sticks open, in case they fall through the wide doorways.

In the bad old days before power-reclose doors, falling out of suburban trains was not uncommon. Even though it was (and still is) a fairly difficult thing for a prudent person to do, past-generation carriage designers were encouraged by past-generation politicians and railway legal advisers to make it demonstrably more difficult to fall out — without the railway's incurring the cost of today's power-door equipment, which even then was the only sensible solution.

This was achieved by constricting the entrance layout. In Sydney, for example, the narrow entrances of the ex-steam stock (4-door wooden 'EBB' cars*) were judged harder to fall out of than the later 1927 steel stock (the Leeds Forge cars)* even though the latter loaded and unloaded much better. So by the time of World War II, the 1940 steel stock was being built with a truly terrible layout from the loading viewpoint, wherein each pair of double-leaf doors was split into two narrow single-leaf ones divided by a wide pillar panel.

Even worse, the transverse internal partitions were set hard against the door edge so that standees leaning against them (i.e. in the most comfortable location) would inevitably block almost half of the narrow door opening. The 1955 steel stock ('Sputnik's') was simply a welded version of the 1940 rivetted body, with 4 motors and 120 volt electrics; it perpetuated its poor entrance design, even though air-operated doors had finally arrived and eliminated the safety justification for an inefficient layout.

Inside, all the old 1-deck steel cars' central saloon aisles lead into the vestibules through a narrow entrance originally fitted with a heavy sticking-type sliding door. Always awkward for most women and young children to move, it existed solely to exclude drafts from people leaving the main side doors open — even though by 1955 the latter were power-reclosed! Lest Victorians' chortle, some Harris cars in Melbourne were every bit as bad, although without the silly internal door.

Happily commonsense has prevailed among the present generation of engineers. There have been considerable improvements in both door and interior layouts, which embody 'tapered' saloon aisles, widening from 'three and two' across through 'one and one', to large and uncluttered vestibules. Power-operated doors are standard, excluding draughts as well as rain, and have allowed the heavy cross-partitions of older cars to be reduced to small weatherscreens, giving a far more spacious interior. All this results in less jostling, and reduced dwell time. And abolition of the 6 o'clock swill has reduced the risk of the other chap being sick on you.

Happier indeed is the lot of today's commuter!

To be continued

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* Why? Can you work this one out — the figures are there.

* All this stock has long since been withdrawn.

* The few that remain may reach age sixty before retiring.

DWAY HEADWAY

Chronology of a

This story is a summary of an address made by Australian National's Chief Civil Engineer, Mr Des Smith, to the Institution of Engineers, Australia, at Port Pirie in October. In carrying out the survey work for the Alice-Darwin proposed line, AN has been furnished with Landsat satellite photographs of the terrain taken from a height of more than a 1000 kilometres above the earth's surface. Two of these unique pictures are printed on page 25.

The Alice Springs-Darwin railway is anything but a new proposal — its history is almost as long as that of railways themselves, in Australia. It's really a thing of romance and legend — the "North South Transcontinental Railway" — A dream that South Australia and the Northern Territory have had for more than 100 years, — and an unfulfilled promise of the Commonwealth more than 70 years old.

The history behind the north south transcontinental railway goes back much further than that of the east-west one. One map of 1906 shows a proposed north-south line and a very conspicuous blank space on the east-west route.

That long history can also be most involved and confusing, especially if you try to take in all the relevant parliamentary debates and the press reports and speculation. I find it best to pick out a few dates as important landmarks or reference points. They are the years 1875, 1910, 1922, 1949 and 1981.

First take 1875, more than 100 years ago. It was at about that time that the idea of a north south transcontinental railway seemed to become credible. Sure, it had been mooted and argued, practically since old J.M. Stuart had passed through the N.T. and since S.A. had got control of the N.T. in 1863.

But from 1875 the proposals for the grand project had a serious and substantive quality.

That was before any construction had begun between Port Augusta and Port Darwin, at the time when railways in Australia were really in their early infancy — consisting just of short lines radiating out from some colonial "capitals" and principal ports. There were no railways at all in W.A., for example.

It's well known that one major factor in the development of the muddle of multiple gauges in Australia was the failure in Westminster to realise that the Australian Colonial Railways might ever be connected. Those actual connections were still some way off in 1875: NSW/VIC at Albury in 1880, NSW/QLD at Wollongarra in 1888, and VIC/SA at Serviceton in 1889.

So at a time when there was much myopia about the effects of different gauges in the different colonies, to talk in 1875 of a North South Transcontinental line was taking a very long-sighted view.

So much for 1875, now lets look at 1910 — the time of the transfer of the N.T. from S.A. to the Commonwealth, and the time of that famous undertaking by the Commonwealth to complete the north south line.

By that time the gap had been reduced to 1700km or so with the construction, by the S.A. Government, of the Railways from Port Augusta to Oodnadatta and from Palmerston to Pine Creek.

The Port Augusta to Government Gums line was started in 1878 and completed in 1882. It was then extended to eventually reach Oodnadatta in 1891. Although S.A. ran out of steam then, some people were sure that the north south line was for real — one of the pubs in Quorn, and the one and only pub in Oodnadatta, were named the "Transcontinental Hotel".

Meanwhile the Palmerston to Pine Creek line had been started in 1886 and finished in 1889. Having got that far S.A. couldn't keep up with the financial burden of continuing the railway, and with the burden of responsibility for the Northern Territory itself.

There had been various flirtations over the years with the idea of construction on the land grant system, but all had come to nought. The creation of the new federation was an opportunity for S.A. to shed its N.T. burden, and negotiations began on those lines as soon as the infant Commonwealth was born.

The agreement was signed at the end of 1907 and South Australia's Northern Territory Surrender Act" went through in 1908. There was a couple of years delay in passing the complementary Commonwealth legislation, the "Northern Territory Acceptance Act, 1910", perhaps because N.S.W. and QLD. didn't like the direct north south route for the proposed railway.

The next auspicious date was 1922, when the Parliamentary Works Committee recommended extensions of the railway from the south to Alice Springs and from the northern end down to Daly Waters.

In the meantime the Commonwealth had extended the line from Pine Creek to Emungalan, on the north bank of the Katherine River, in 1917.

No other progress had been made, no doubt because of pre-occupation with the construction of the East-West Transcontinental Line between Port Augusta and Kalgoorlie at that time, and the labour and material shortages caused by the Great War.

But the planning had been going on — the 1916 Commonwealth Railways Annual Report advised that permanent surveys were complete from Katherine to Mataranka, trial surveys from there to Daly Waters and an exploratory survey was planned from Oodnadatta to Daly Waters.

That reconnaissance was made in 1917 by railway surveyor Joseph Waters, who was instructed to examine the route along the Overland Telegraph Line, and also a route directly north from Oodnadatta to Anthony Lagoon, thence north-west to Daly Waters.

To quote from Joe Waters' report: "The party consisting of four camelmen, cook and myself with 25 camels, provisions and equipment left Oodnadatta on March 24th 1917. After an absence of 266 days, we arrived back on December 14th 1917 at Oodnadatta, having travelled 2,850 miles. Frequent stoppages were made on the route for investigations and measurements. A daily average travel of 10-11 miles was made. Three camels died during the trip".

South Australia made sure of the Oodnadatta to Alice Springs extension along the so-called "Direct Route" by linking it in a 1925 agreement with the Commonwealth, dealing with the Port Augusta to Adelaide connection via Redhill.

By 1929 the line to Alice Springs was completed, and at the same time the southwards extension from Katherine stopped at Birdum, 70 km short of Daly Waters, after the work had slowed down as Australia entered the depression.

The gap between Alice Springs and Birdum was about 1,000km, after the near fulfilment of the 1922 recommendations.

dream coming true

The next significant date was 1949, the time of a further commitment by the Commonwealth, in the 1949 South Australian Rail Standardisation Agreement, to convert the existing C.A.R. and N.A.R. to standard gauge, and to build a standard gauge connection between them to complete the north south transcontinental railway.

The final historical date is February 1981, when Federal Cabinet approved a $10 million expenditure over three years on survey, design and planning for construction of a standard gauge railway between Alice Springs and Darwin.

The old section from Port Augusta to Marree had been replaced by a standard gauge line in 1957, and then later bypassed by the new Tarcoola-Alice Springs line which superseded the whole southern section to Alice Springs. In the meantime the northern section Darwin to Larrimah had virtually ceased to exist when it stopped operating in 1976, and the gap in the Transcontinental line had widened back out to about 1,500km.

In his election policy speech late in 1980 the Prime Minister announced that his government would build the railway to Darwin, and complete it by 1990. To date that has not changed (although the N.T. Government has pressed for a 1988 completion) and the project is on that schedule.

The actual construction of the Alice Springs — Darwin railway has not been finally approved — that requires an Act of Parliament. But since that Act must contain a description of the route and the limit of permissible cost, some of the survey and planning must come first.

The work we are doing now includes all the preliminaries to construction, up to the stage of being ready to order materials and let construction contracts. It's being done in a very similar way to that of 10 years ago for the Tarcoola-Alice Springs railway — the engineering by a small AN staff, and the survey and investigations by other agencies.

Survey and mapping is being handled by the Australian Survey Office, geological work by the N.T. Department of Mines and Energy, water supply investigations by the Water Division N.T. Department of Transport and Works, and anthropological research by a joint venture set up under the general administration of the N.T. Sacred Sites Protection Authority.

The sequence of work begins with the selection by AN of a corridor for mapping — from whatever existing maps and data are available, plus reconnaissance and sometimes preliminary investigations. Basic corridor width has been five km for a single run of aerial photos, plus four km for each of any extra parallel runs.

From the aerial photography and associated control survey a system of digital data acquisition and storage is used, with the primary output in the form of 1:10,000 scale contour maps.

The precise railway alignment is fixed from the photos and contour plans, plus the other information, anthropological, geological, etc — the whole data on the physical and cultural terrain with such trial survey and field checks considered necessary to make sure we've got it right.

One advantage of the digital terrain data is that profiles along trial lines can be computer-plotted without the need for any field work.

The geological work is mainly aimed at getting the detailed information for design and construction of earthworks and bridges — call it engineering geology, or geo-technical engineering, as your wish. It includes the detailed mapping, sampling and testing of soils and rock along the route to determine suitability of materials for earthworks, predict excavation conditions, fix stable slopes in cuttings, and to determine foundation conditions at bridge sites.

A very comprehensive research programme on Aboriginal sites is in progress, into the nature and distribution of sites along the railway corridor, followed by negotiations with "Traditional owners" on the railway alignment and on any conditions to be observed to protect sites from damage or intrusion.

The present status is that, in the 500km Alice Springs to Tennant Creek section, the photography and contour mapping are complete, some 220km of alignment has been fixed, final survey is progressing 180km north of Alice Springs and the subsequent site investigations and design are well under way.

The top end 300km Katherine to Darwin, is at a comparable stage. Here the line will generally follow the old narrow gauge railway alignment from Katherine to Adelaide River, with deviations (of up to 20km length) to improve grades and alignment.

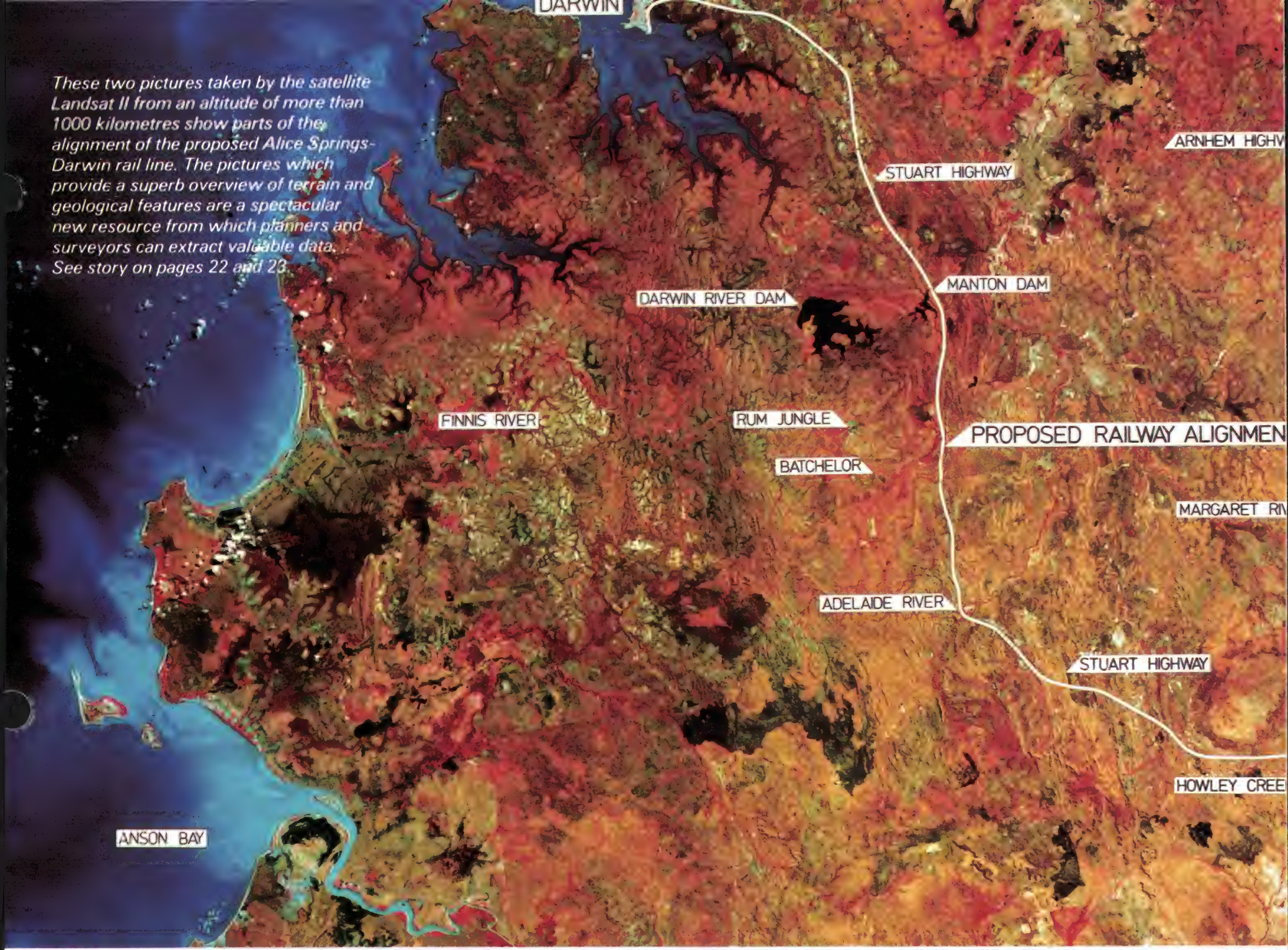
Between Adelaide River and Darwin the old alignment will be abandoned and the new railway will be generally close to the western side of the Stuart Highway.

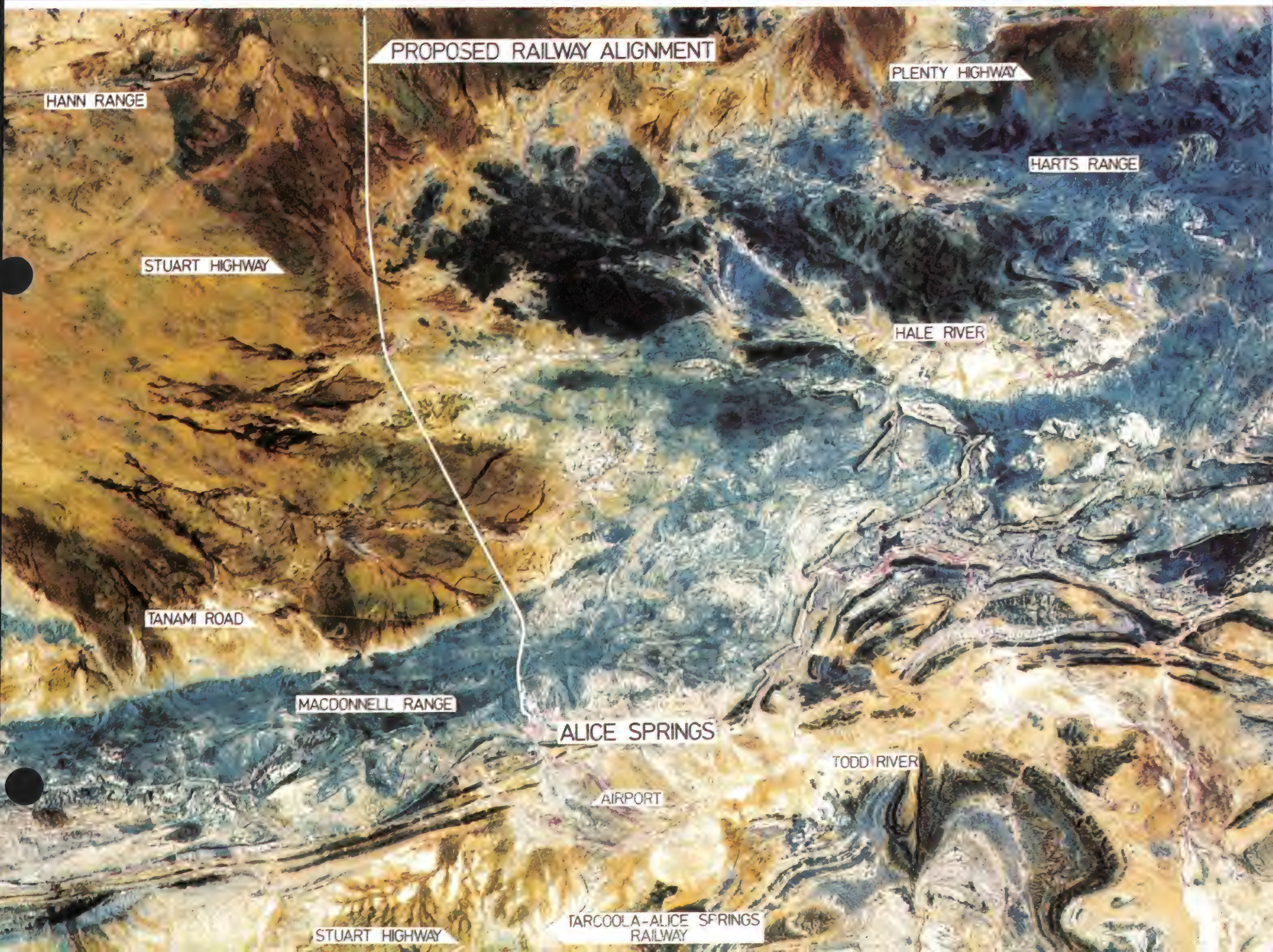
Final surveys are in progress northwards from Katherine towards Pine Creek and between Adelaide River and Darwin.

If a decision is made to go ahead and the enabling Act passed early in 1983 it is possible for the line to be finished by the 1990 target date, or with some extra effort, by 1988 if that is what the Government decides it wants.

So that covers the past and the present, and the possibility for the future. The north south transcontinental railway project may be close to becoming a reality. Perhaps with 10 years we will be able to add 1988 or 1990 as the final landmark date in the story — the date when the first train runs all the way between Adelaide and Darwin.

These two pictures taken by the satellite Landsat II from an altitude of more than 1000 kilometres show parts of the alignment of the proposed Alice Springs-Darwin rail line. The pictures which provide a superb overview of terrain and geological features are a spectacular new resource from which planners and surveyors can extract valuable data.
See story on pages 22 and 23.





An Ode to the Indian Pacific

Dear Sir,
Having just returned from a holiday in Australia, my husband and I were fortunate enough to enjoy a trip on the Indian Pacific train, journeying from Perth to Sydney.
We enjoyed watching the series 'The Great Train Journeys of the World' on television, but to actually experience the journey was a most exciting adventure for us. Everything lived up to our expectations, and I would like to compliment you on the wonderful service, smooth running of this fascinating train journey.
I was so inspired by this trip, that it prompted me to write a poem describing the course of events while we were actually witnessing this journey. I am enclosing the said poem to you, as I thought you might be interested to note my comments in verse.
Yours sincerely,
Mrs Hazel Rosenthal
14 Hathaway Drive,
Giffnock, Glasgow

The Indian Pacific or Train of Thought

From Perth City to Sydney is a journey worthwhile
To set foot on this train, oh she really has style
She's not like the others, an ordinary train
She's just like a Queen on the rails she doth reign

The welcome she gave us, that very first night
She stood in the station all shining and bright
We travelled first class, she sure did insist
With luxurious amenities, not to be missed

This was our home for three days and three nights
From the west to the east, oh we did see some sights
To relax in the lounge, a piano was there
For someone to play t'was something quite rare

Her ladies in waiting they hovered around
To look after our needs without even a sound
We dined and we wined and relaxed all the while
This sure was good living, all we did was just smile

O'er stretches of land not a soul to be seen
Not a bird in the sky, just the land all serene
But the sunsets we saw, to describe them I'll try
The contrasting colours, one just wants to sigh

The pinks and the blues and the mauves they did blend
Down to the horizon they seemed to descend
This is a haven, an artist's delight
To paint such a picture describing a sight

And by contrast to witness, the sunrise at dawn
An array of those colours last night that had gone
These pleasures are simple, not to be forgot
One of God's wonders, believe it or not

It's Central Australia we're now passing through
The scenery is different an odd Kangaroo
At Port Augusta we did stop for a change
To set foot on Terra Firma, it did feel so strange

Our next call's Port Pirie, we're now going East
A day and a night then in Sydney we will feast
Our Royal Hostess has our welfare at heart
So sorry she is to see us depart

Throughout all those miles, she has cared for us well
And will bring us in safely, I can surely foretell
This has been a journey I can recommend
But don't come alone, bring along a good friend

I'll be sorry to leave her, our gracious Royal Queen
But I hope to return, this is surely my scene
I'll look back on this journey and I'll reminisce
On a trip of a lifetime, an experience not to miss.

Boom barriers bolster safety drive

The Victorian Government has started a $9.4 million four-year plan to install boom barriers at 70 level crossings in Melbourne and provincial cities.

Mr S. M. Crabb, Minister for Transport, said fifteen of the crossings will be equipped this financial year.

Ministry statistics show crossings covered by the program totalled an average of six pedestrian and 15 train-vehicle collisions a year.

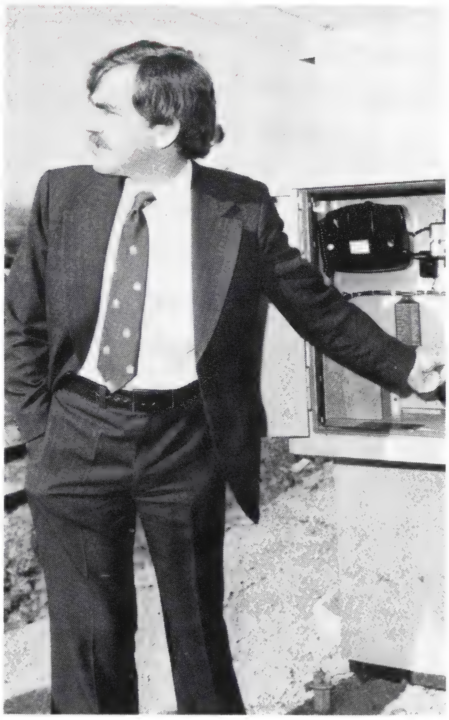
Mr Crabb said an analysis of accident records showed unprotected crossings with double railway lines were more likely to be dangerous.

"Although flashing lights might still be operating, some drivers move across the crossing after one train has passed, not realising that another train is coming on the other track," said Mr Crabb.

The Minister said the program would be financed under a new streamlined funding program which would allow the cost to be taken from the Transport Fund.

In the past funding has been split between VicRail, the Country Roads Board and local councils. A significant problem has been that councils have been unable or unwilling to pay their share.

Mr Crabb gave an undertaking to initiate the program after a young girl was killed at an unprotected crossing in North Coburg in May. Barriers have since been installed at the crossing.



● *Minister of Transport, Mr S. M. Crabb, brings the Bakers Road boom barriers into operation.*

Metrol makes its mark . . . on screen

On the left hand side of a screen the size of a television set, one of several of grey lines suddenly changes to lime green.

This green line extends past several triangles and as it heads towards the centre of the screen it drops at a 45° angle, picks up the next straight line, passes more triangles and stops when it comes to a solid blue rectangle.

Meanwhile back on the left hand side of the screen a small 10cm long red line replaces the green line. As this red line travels along the green path, the line behind reverts back to its original grey colour. When the red line reaches the purple rectangle, it too stops.

If you think you have just collected a bonus 500 points for making it safely home in a space video game — well, not quite.

Granted, lines that change colour, move and follow other lines and strange looking symbols are all features of the video game craze.

Actually it is a train arriving at Flinders Street station that is being monitored on VicRail's new computerised train describer system. The grey line indicates railway track, green shows how far the path has been set in advance of the trains and the red indicates the actual train.

The triangular symbols indicate field objects such as signals, points and track circuits.

The train describer and remote control system is the "ultimate" for anyone who likes "playing trains".

Unfortunately for those of that inclination, the system has a much more important role to perform.

It has the potential to monitor and control all trains, including country passenger, parcel coaches, freight, light locomotives, that operate on suburban lines in the inner-city region.

This computerised program is located at Metrol, nerve centre of VicRail suburban train operations. The area covered extends from North Melbourne through to Clifton Hill, Burnley, Caulfield, Sandringham, St. Kilda, Port Melbourne and includes the underground City Loop.

In the train describer system all train trips in the suburban area have been allocated a four digital number — no two trips have the same number. Weekday train trips retain the same number from Mondays to Fridays.

In this four digital system the first number indicates the group of lines the train is operating on, the second number shows if the train is going direct to or from Flinders Street from North Melbourne, Jolimont or Richmond or travelling via the City Loop, while the last two numbers indicate the "up" or "down" direction of that particular trip.

When a train approaches the boundary of the area covered by the system, the signalman at the "fringe area" signal box punches the coded train number into the system.

It is then the responsibility of staff at Metrol to prepare the route for that train.

To set the route, the Area Controller sends a command to the computer via a keyboard on his desk. He then sets the route for the train.

This is when the line changes from grey to green. As the track is set for the train, the train describer number for the approaching train appears above the track, between each field object.

As the train travels along the set route, the green number turns to red and is removed from the screen after the train clears the section. The Controller can then set the route for the next train.

So, for the first time since the development of the train control system earlier this century, staff can see the actual location of trains under their control.

Previously control staff were advised of the location of trains by signal and station staff. They plotted the movement of trains on large train graphs.

By punching a code into the computer the Area Controller can see on his screen anything from a whole section of track to an enlarged view of one portion of one track. If the Controller wishes he can have just the track displayed, the track with only signals or the track with all field objects.

Developed by L.M. Ericsson Pty. Ltd., the cost of the computerised program has been shared between VicRail and the Melbourne Underground Rail Loop Authority (MURLA).

Controllers at Metrol involved with the operation of trains in the suburban area. The bank of six screens include a view of platforms two and four at Museum station, and what is being displayed on the next train indicator on both platforms.
Inset: A controller sets a path for a suburban train. *See story on page 27.*

KINGSTON

The commissioning of electric train services on Brisbane's Kingston-Shorncliffe line in September brought the city's suburban network on the home stretch to total electrification.
The official opening was held at Kingston Railway Station on September 18, and the official party included the Premier of Queensland, the Hon J. Bjelke-Petersen, the Minister for Transport, the Hon D. F. Lane, the Deputy Premier and Treasurer, the Hon Dr L. R. Edwards, Commissioner for Railways, Mr P. J. Goldston and representatives of major contracting organisations involved in the construction of the project.
The project's genesis, the first step in a $260 million scheme, came in November 1979 with the running of the first electric train service in Brisbane — from Darra through Central to Ferny Grove.
That first stage of electricfication provided a fast electric service to 26 stations along a 34 kilometre route. Stage two involved electrification from Darra to Ipswich, connecting another 11 stations over a distance of 23 kilometres.
Commissioning of the Kingston-Shorncliffe section, the 93 kilometre stage three, signals completion of two thirds of the total system.
With the completion of stage four, the corridor from Petrie to Thornside late in 1983, all principal suburban rail corridors will have been electrified.

Electrification and modernisation of the Brisbane suburban rail network is part of the Queensland Government's multi-million dollar program to provide a properly integrated and efficient system of public transport in the metropolitan area.

This is part of a program of improvements being co-ordinated by the Metropolitan Transit Authority. Other projects in the present program are the construction of station car parks and bus/rail interchange facilities and, in conjunction with the Brisbane City Council, the construction of bus interchanges and general improvements to bus services.

By 1984, the Ferny Grove-Ipswich, Kingston-Shorncliffe and Petrie-Thornside networks will carry passengers in air-conditioned comfort in virtually every direction.

The next tasks will be to build and electrify the Petrie-Redcliffe line and to upgrade and electrify between Kingston and Beenleigh.

Total expenditure to August 31 last was $201 million, including $20.6 million for the cross-river railbridge and $73.5 million for electric cars.

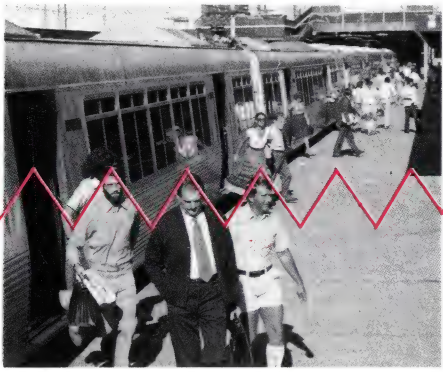
The Merivale Street bridge, badly needed for 50 years, has resulted in an increase in rail patronage by southern suburbs residents to the city centre and beyond of 44 percent.

Walkers-ASEA, Maryborough, are adding to the fleet every month one three-car, electric, air-conditioned unit under a 108-car order, which followed the delivery of the first 72 cars.

According to Transport Minister, Mr Don Lane, constant evaluation and employment of most modern technology has resulted in Brisbane having, at Mayne, possibly the largest centralised traffic control complex in the southern hemisphere.

"It has also resulted in commuters having top-class carriages and service," he said.

"It is a matter of great satisfaction to the Railway Department that electrification of the Brisbane suburban area has reached the end of the third stage and is well on the way to completion of the fourth stage."



SHORNCLIFFE

Walkers-ASEA, the joint venture company has won all three contracts so far awarded by Queensland Railways and will have manufactured 180 cars for the Brisbane electric system by 1985.

One car is completed every 5½ working days at the modern assembly plant next to the Walkers Limited engineering works. Every four weeks another three-car electric train is delivered to Queensland Railways, after having undergone rigorous safety and performance testing by the contractors.

The assembly plant was designed and built by Walkers Limited specifically for the project.

Systems. ASEA Pty. Ltd. built a plant across the road from it to produce electronic cabling and control systems for the trains.

The contract is the first by the joint venture, but both companies have extensive experience in the design and construction of trains.

Walkers Limited, one of Australia's largest heavy engineering and foundry firms, built its first locomotive, the Mary Ann, in 1873.

The company built more than 700 steam, diesel electric, diesel mechanical and diesel hydraulic locomotives for railway systems throughout Australia, including the famous C36 class for the Transcontinental Railway.

ASEA Pty. Ltd., is the Australian subsidiary of the Swedish ASEA group, one of the world's largest electronic companies.

They provide the transformers, thyristors, motors, control gear and cables for the Queensland trains. The heavy duty electric equipment is imported from the company's main plant in Sweden, but some of the motors are made in Sydney and all of the looms are made in Maryborough.

A maximum allowed speed of 100 kilometres an hour combined with a smooth high rate of acceleration and braking will allow an average reduction in running time of between 20 and 25 percent compared with the time taken by present diesel hauled trains.

Communications between train crews and train control will be by means of a four channel UHF high security selective calling radio link which will enable coded messages to be transceived, as well as normal voice communication.

A crew to crew intercom also is provided, as well as a crew to passenger public address system. The cars are air-conditioned, have carpets in the seating sections and lighting from ceiling mounted fluorescent units.

Double glazed tinted windows are fitted to reduce glare, heat transfer and interior noise.

Seats are cantilevered from the side walls to give a clear floor area for the storage of hand luggage and to facilitate cleaning. Seating is arranged in pairs with individual foam cushions and backs covered with woollen fabric.

The cars provide very comfortable air conditioned travel for up to 248 seated passengers in each three car set, with capacity for over 250 standing passengers also during morning and evening peak periods. Brisbane's commuters are delighted with modernisation of the suburban System.

Above: The first electric train departs Kingston Station for Shorncliffe. Right: QR Commissioner Mr P. J. Goldston speaking at the official opening at Kingston. Main picture: Inaugural electric train arrives at Sandgate.

Jim steps aside after marathon effort

Queensland's 15th Commissioner for Railways, Mr P. J. Goldston, has announced his intention to retire on 17 December 1982. He has been the Railways Chief Executive since July 1976.

Mr Goldston commenced with the Railways more than 48 years ago at the age of 16 years as an Apprentice Fitter at Mackay and obtained a Diploma in Mechanical and Electrical Engineering at the Queensland University. He is a Member of the Institution of Engineers of Australia.

Commissioner Goldston held mechanical engineering positions in Rockhampton and Ipswich until 1954 when he was appointed Locomotive Engineer for the Central Division based at Rockhampton.

In 1963 he was appointed General Manager of the South Western Division and 2 years later returned to Rockhampton as the Central Division's General Manager.

Whilst occupying that position Mr Goldston steered the operation of bulk haulage introduced into Central Queensland to cope with the massive export coal traffic. As Commissioner he continued to oversee the boom in coal traffic to the position where in excess of 30 million tonnes of coal are now hauled annually.

Mr Goldston was also involved in the almost completed program for Brisbane suburban electrification costing $260 million.

Centralised traffic control was progressed further during his tenure as well as improved methods of transport including refrigerated containers and also the introduction of centralised freight and parcels accounting. Probably equally noteworthy was his development of a planning and development section and the corporate planning process in Queensland Railways.

A staff training organisation was introduced by Mr Goldston and this has now been extended throughout the State. Commissioner Goldston is Chairman of ARRDO and the ROA Commissioners of Australia Conference.

Married with four sons, Mr Goldston plans to spend some months in the United Kingdom following his retirement.

Mr Goldston is handing over 'his' rail system having nurtured it to a condition of glowing health.
In his last Railway Department Annual Report tabled in the Queensland Parliament recently, he was able to record significant improvements in the system's performance.

Coal and minerals accounted for 79.3 percent of the 43.5 million tonnes of freight carried on Queensland rail last year.

Haulage of coal increased by 330,000 tonnes and of minerals by 420,000 tonnes, to aggregate 34.6 million tonnes.

The report covered increases generally across the board in freight, passengers and revenue.

Passenger journeys jumped from 31.8 million to 34.2 million and were up in the city (2.26 million) and country (101,042).

Mr P. J. Goldston

funds

States get $22m. for 'main line' works

The Commonwealth Minister for Transport and Construction Mr Hunt announced recently that the Commonwealth has allocated $21.8 million to State Governments this financial year for projects to upgrade main railway lines.

In making the announcement Mr Hunt said the funds are being made available under the National Railway Network Program and involved allocations of, $6.4 million to New South Wales; $8.4 million to Victoria; $5.9 million to Queensland, and $1 million to Western Australia.

Mr Hunt noted that the Commonwealth directly funds similar upgrading programs in South Australia and Tasmania through its funding of the Australian National Railways Commission. Specific projects mentioned by the Minister as being funded by the program included:

- New South Wales — installation of centralised traffic control and crossing loops between Albury and Junee, and — centralised traffic control facilities between Telarah and Taree.
- Victoria — installation of centralised traffic control and crossing loops between Sunshine/Ararat/Serviceton, and — upgrading of the South Dynon container terminal in Melbourne.
- Queensland — installation of centralised traffic control between Caboolture and Gympie, and — development of facilities at the Acacia Ridge freight terminal, Brisbane.
- Western Australia — upgrading of the Kwinana to Mundijong railway line.

Mr Hunt drew attention to the fact that with the inclusion of the $21.8 million this financial year, total allocations to participating States under the National Railway Network Upgrading Program would be more than $66 million over the past five years.

faces

Following the Railways of Australia Civil Engineering Conference in Adelaide, earlier this year, it was an "eyes-on" demonstration in the Adelaide Hills of the McKay Safelok rail fastening system. From left to right, those inspecting the Safelok system are: Mr Rob Schwarzer, Chief Civil Engineer, State Rail Authority, NSW; Mr Merv Abbott, Chief Civil Engineer, Westrail; Mr Jack Emmins, Chief Civil Engineer, Vicrail; Mr Harold Hanson, District Engineer, Australian National, Adelaide; Mr Len Sheppard, Sales Manager, McKay Rail Products; Mr Neil McDonald, Assistant Chief Civil Engineer, Vicrail (partly obscured); Mr Bill Fahey, Manager, Engineering, Hamersley Iron; Mr Trevor Sando, General Manager, McKay Rail Products (partly obscured); and Mr Wally Remes, Research and Development Engineer, McKay Rail Products.

Development of bogies for XPT

The design of power and trailer bogies for the State Rail Authority's ultra modern XPT passenger trains presented COMENG with substantial engineering problems in meeting operating parameters of the new high speed vehicles on Australian track not specifically constructed for this purpose. Herewith is the third and last article in a series written by COMENG Assistant Engineering Manager and Member of the Institution of Engineers of Australia, Colin F. G. Butcher, dealing with some of the studies undertaken on the XPT bogie development.

The reason for the higher rate of rise of the BT10 ride indices may now be seen to be due to a shift towards more critical frequencies as speed increases. The transfer functions contain the car body flexure modes and this may be the cause of the peak at 12.5Hz in the vertical transfer function for the CT22 bogie. This frequency equals the input from the wheel eccentricity at 155 km/hr.

The most critical lateral frequencies coincide with track wavelengths of about 30m. This may be a feature of the track alignment, but it is also close to the hunting wavelength of the bogies for low conicity conditions. There are a couple of problems with this hypothesis. At about 1Hz the lateral transfer functions are unity (0dB), and therefore, the amplitude of wheel lateral movement would need to be about 3mm. This displacement could be expected to generate higher effective conicities and shorten the wavelength. This may be countered by lower creep conditions, in which case, greater suppression of the motion would be expected on curves. The small frequency difference between the bogie types is, however, consistent with hunting and would account for the slightly higher accelerations with the CT22.

The projected ride indices at 160 km/hr on 90% of the Main South Track were found to be:

	BT10	CT22
Vertical ride index	3.1	2.7
Lateral ride index	2.7	2.8

The ride vibrational analysis ignores the quazistatic lateral acceleration due to operation on curves at above the equilibrium speed for the applied cant of the track. There is general agreement that the steady state lateral acceleration experienced by passengers should not exceed 0.85 m/sec^2 with short duration peaks of no more than $1.2m/sec^2$. With conventional bogies the roll angle accounts for about 30% of this total and so the input acceleration should not exceed $0.6m/sec^2$, which is only marginally more than the accepted practice in Australia. The rate of change of lateral acceleration is also recognised as an important factor but there is less general agreement concerning appropriate limits. In Europe, cant gradients are very low and the jerk rate generally does not exceed $1m/sec^3$, but limiting values of up to $2.4m/sec^3$ have been proposed in North America. The curves at the test sites all have a speed limit of 115km/hr based on a cant deficiency of 75mm for passenger trains. At this normal speed limit the steady state lateral accelerations in the main body of the curves were higher than calculated but were not excessive.

The lateral accelerations at the curve entry and exit transitions were, however, very high with rates of change above $3m/sec^3$ at one location. At higher than normal speeds, the lateral accelerations were sufficient to take up the limited suspension travel of the BT10 bogie and the firm contact at the bump stops permitted transmission of high frequency accelerations which reached peaks of $3.8\ m/sec^2$.

On the large radius curve where the maximum speed of 140km/hr was attained, lateral accelerations reached peaks of $1.5m/sec^2$ for the BT10 and $1.4m/sec^2$ for the CT22. At the end of this curve the accelerations rose rapidly and then fell suddenly as follows:

	BT10	CT22
Ramp up (m/sec^3)	1.6	1.7
Peak acceleration (m/sec^2)	1.1	1.0
Ramp down (m/sec^3)	3.2	2.3

Similar values were obtained at the entry and exit to most curves including locations where the curves joined without any intervening straight. There was some evidence that the bump stops limited energy stored in the roll-lateral suspension systems of the BT10, with consequent reduced rate of change at curve exits.

Passenger bogie design. After completion of the ride tests and receipt of an interim report on the results, the State Rail Authority selected the more expensive BT10 bogie as the basis for the XPT car bogie design. The original British Rail proposal envisaged using larger air springs and longer swing links to substantially reduce the secondary suspension stiffness, however, the ride tests clearly demonstrated the need for greater lateral suspension travel and this also influenced the scope of the design changes required.

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Last Pirie run for Loco 520

All eyes were turned by the 520 Class, Sir Malcolm Barklay—Harvey steam engine as it pulled into Port Pirie earlier this year, the final steam train trip on the broad guage line from Adelaide to Port Pirie. The line converted to standard gauge this month in a $68 million project. More than 750 camera clicking, sound recording train 'fanatics' from all over Australia were aboard the steam handled train.

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The initial intention was to use the air spring type fitted to British Rail bolsterless bogies for suburban cars, but the tests showed that the air spring type used on the CT22 bogie was more appropriate for New South Wales track conditions and this style was incorporated in the final design for XPT.

The space required for this large air spring was obtained by raising the bogie frame, lowering the spring plank and increasing the longitudinal spacing of the swing links. The lateral spacing of the air springs was reduced so that the overall width remains within acceptable limits for non-metropolitan rolling stock. As the design of the car progressed it became clear that the car body mass would be significantly less than the original conservative estimate and this opened the way to using an air spring with a particularly low axial stiffness. The body bounce natural frequency will be close to the upper limit of the motion sickness region and is therefore, probably the lowest acceptable stiffness for XPT vehicles.

The bogie frame strain gauge test results confirmed the theoretical view that force inputs on New South Wales track are higher and more frequent than experienced on British Rail track, but analysis showed that the fatigue life of the frame is more than adequate. Similarly the strain gauge tests of the axlebox confirmed that the modified design, introduced after some early failures on British Rail track, would give infinite life in New South Wales service.

Apart from suspension design changes the XPT bogies incorporate a number of features not included in the standard BT10 design. Spring applied, air released parking brakes are used on one disc on each axle. The outer wheelset has tread scrubber blocks in constant contact with the wheels to assist signal circuit continually, similar to the system used for over 20 years on disc braked diesel railcars in service with the State Rail Authority. The bogies are also attached to the car body so that they are raised when the car is lifted and are less likely to become detached in a derailment.

The final design is classified as British Rail type BT23, SRA code NHA and has a frame and suspension mass only 0.2 tonnes higher than the standard BT10. The wheelset mass has been increased substantially by using a thicker rim, plate and disc resulting in a total mass of about 6.5 tonne per bogie.

Power car

General. The HST power car bogie design was adopted as the basis for XPT from the outset, however, it was recognised that a number of changes would be necessary to suit New South Wales operating conditions. Bogie trials were not a practical proposition within the project timescale and all of the development had to be based on theoretical studies. The main items investigated were the vehicle ride performance, the traction system operating environment and the fatigue life of the main frame. Changes to suspension rates and working clearances inevitably lead to design modifications and other changes were introduced that took into account the operating experience with the production HST sets.

Ride performance. The HST power car does not ride as smoothly as the passenger cars and this tends to adversely affect the ride of the leading car of an HST set. The ride comfort index at 200km/hr is 2.9 vertically and 3.2 laterally which is quite acceptable for a vehicle of this type, but suggests a poor performance could be anticipated on tracks maintained essentially for the safe operation of freight trains.

The HST secondary suspension has a static deflection of only 130mm giving a bounce natural frequency of greater than unity. Coil sprung passenger cars used in New South Wales have about double this static deflection and their roll stiffness is still adequate without the added complexity of anti-roll bars. With this in mind the XPT secondary suspension rate was set at half that of the HST. The anticipated vertical ride index with this softer suspension is no more than 3.0 at 160km/hr on 90% of the Main South Line.

The lateral suspension of the HST power car is relatively soft with a natural frequency of 0.7Hz. This should povide a good quality ride but HST has limited lateral suspension travel and bump stop contact is maintained on most curves. This limitation has been revised for XPT and the coil springs have been designed to cope with the much higher shear deflections. The increased secondary suspension travel eliminated the possibility of retaining the original centre pivot design in which all lateral, vertical and rotational movements are taken by a pair of multi-layer rubber traction pads. The high deflection and low shear rate requirements were obtained by using sandwhich pads originally developed for diesel and electric locomotives supplied to the State Rail Authority.

These pads have a high compressive stiffness and therefore could not be tilted to accommodate relative rotation. This was resolved by introducing a central pivot pin.

The primary suspension rate was not changed but the travel was increased from 30 to 40mm to cater for the anticipated larger dynamic movements in line with the following estimates (mm):

	HST	XPT
Pitch at full braking	7.4	7.4
Maximum roll	7.6	8.7
Dynamic at dip	13.8	20.4
TOTALS	28.8	36.5

The rubber pads used in the HST axlebox locating links could not withstand the higher deflections and so a new design was developed to suit 50mm vertical travel, thus providing a generous reserve capacity. The arrangement of the links was also changed to obtain greater space for the disc brake equipment and to minimise axlebox rotation at high vertical displacements.



Traction motor environment. The XPT is not only a high speed train, it must also be capable of climbing the long steep gradients on most New South Wales mainlines. The traction motor rating and gearing were selected on the basis of one power car hauling four passengers cars up the 17km long 1-in-30 gradient on the Unanderra to Moss Vale line and also took into account the possibility that XPT sets may regularly need to restart on gradients of 1-in-40 if manual tablet exchange is not replaced by CTC. The gear ratio could not be lowered to take full advantage of the lower top speed as the coaxial drive restricted the reduction in pinion size. Any reduction in gear ratio does, however, mean an increase in the dynamic torque applied to the motor armature and drive system.

In addition it was anticipated that the discrete defects in New South Wales track would be found to be more severe and more frequent making the traction motor environment particularly arduous.

On British Rail track the joint dip is characteristically 20mm deep with an angle between the rail ends of 20 milliradians. These dips occur about once in every 10km. The initial assessment of New South Wales EM80 track recordings suggested that dips of 22mm occur every kilometre and 28mm dips occur once in every 10km.

Subsequent detailed analysis revealed a significant difference between dip population in average track and in track where sustained high speed is a realistic possibility, as follows:

Cumulative probability for 10km	1	10	20
Poor track, low speed	33	25	23
Good track, high speed	24	18	16

The dip angle was found to be reasonably proportional to the depth and slightly greater than the equivalent dips on British Rail track.

The dynamic response at rail joints is dependent on the track spring rate and its effective mass. From static deflection data supplied by the State Rail Authority the dynamic stiffness was estimated to be 50MN/m/rail. The effective mass of timber sleepered track laid with 53kg/m rail was estimated to be 190kg/rail. These parameters are significantly less than data used to model European track and this tends to alleviate the severity of the geometric defects.

This dip data was used with speed probability curves to determine the dynamic environment of the drive system and the bogie frame. The armature torque and primary suspension force levels were found to be more severe and more frequent than experienced by HST on British Rail track, but were generally within the capacity of the components concerned.

Bogie frame. The basic HST frame was adopted for the XPT although the need to raise the main side members to increase primary suspension travel whilst retaining the same transome height to suit the traction motors, introduced some modification to the detail geometry. One area of concern was the transition in the side members at the inboard side of the axlebox where the bottom flange contained a sharp curve and a 'T' butt junction. The original British Rail stress analysis and strain gauge testing concentrated on the stresses adjacent to this transverse weld but the low stresses found in this area suggested substantial stress flow into the sides of the box section. The stress distribution was investigated in detail by strain gauge testing a full size section of the frame. The results showed that considerable in-plane bending occurred at the start of the curve in the bottom flange and this was found to be in close agreement with a finite element analysis of the section.

The 'T' butt weld was replaced with a smooth transition which reduced the maximum stress by almost 30%.

The detailed stress analysis also showed that the flexing of the flange introduced transverse bending at the flange to web junctions and that this connection would be at risk under New South Wales operating conditions. The new shape improves the flange effectiveness and so reduces the transverse bending and increases the fatigue life of the frame. Some other minor detail changes were made to improve weld details and reduce local stress effects. Changes to the method of traction motor mounting and the gearbox torque reaction link arrangement, have permitted the elimination of access holes that may have been a source of internal corrosion.

Conclusions. The cyclic and discrete track irregularities in New South Wales track have been determined and have been shown to be entirely different to those found in high speed passenger track in Europe. The item that requires further investigation is the definition of long wavelength variations in the track lateral alignment.

The suspension parameters of the express passenger train have been shown to be suitable to achieve a satisfactory standard of ride comfort for both passengers and crew at the maximum operating speed. The high rate of change of lateral acceleration due to the short transitions between straights and curves, has been identified as the major limiting factor in reducing journey time whilst maintaining a high level of passenger comfort.

The fatigue environment of the main structural elements of the bogies and other critical components, has been defined and appropriate changes have been made to achieve an acceptable service life.

Westrail has begun the movement of 23,000 steel pipes for the Natural Gas Pipeline Project.
Twelve rail wagons were used to move the first consignment from Kwinana to Narngulu, near Geraldton. The wagons have been fitted with special bolsters manufactured at Westrail's Engineering Workshop at Midland. Heavy duty webbing is being used to secure the load during transit.
An immediate order of 1,500 pipes required in the the first two weeks has been met by Westrail. The twelve months contract by Westrail will enable extension of the Dampier-Perth pipeline from Geraldton.

Systems on trial

Rail systems freight services across the continent went on trial recently when seven open standard gauge wagons loaded with colourbond "Top Hat" coiled steel left Lysaght's Western Port Steelworks rail siding in Victoria.
The 350 tonne cargo arrived in excellent condition at Westrail's Robb Jetty Freight Yard after a 3500km journey taking 6 days.
Lysaght's representatives travelled on the same freight train with the cargo for most of the journey before joining the Trans Australian at Kalgoorlie for the trip to Perth.
The total transport time for this trial by rail cut previous shipping movements by half.
Mr George Weston, Lysaght's Transport Co-ordinator, said in Perth, "For sometime my company has seen the need to use another mode of transport to bring colourbond to the West. We've been using sea now for a number of years and this has involved a 28 day turn around.
"There is a need to bring material over more urgently than that and following successful trials into South Australia we thought the time was right to try to move colourbond into Western Australia once again."

At the recent International Conference on "Resource Development and Shipping", Australian National Chairman, Mr Lou Marks addressed delegates on a topic of critical importance to all Australian rail systems — the capability of railways to service the land transport needs of inland development projects.

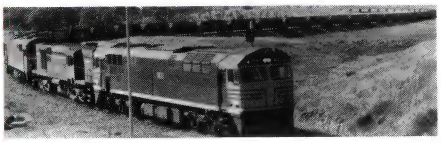
Dramatic role for railways

By Mr L. Marks Chairman A.N.

There can be little doubt that among the most significant developments in Australia's history has been the discovery, the winning and the sale of our nation's abundance of natural resources.

Little doubt also that the growth in our export market of minerals brings great credit to developers and governments alike.

I'm always delighted to speak on the subject as it affords me the opportunity to highlight the vital and dramatic role played in the development of those resources by railways, a far too often maligned transport mode.



It is my belief that in reviewing railways' future capacity to meet the demands of the minerals scenario we should first consider and indeed applaud rail's performance to date as a cost efficient bulk mineral carrier.

Railways of Australia, and here for the sake of our exercise I combine both the private enterprise and government railways, have experienced, in a little more than twenty years, a growth in natural resource traffic to a point where mineral hauls now comprise almost 60% of the total tonnage hauled by the combined railway systems.

The Australian Railway Research and Development Organisation (ARRDO) estimate that the government owned railways total freight task will grow by approximately two-thirds during the 1980s from 35 thousand million tonne-kilometres in 1978/79 to 57 thousand million tonne-kilometres in 1989/90. Of that spectacular growth ARRDO anticipates that mineral traffic will more than double to 32 thousand million tonne-kilometres and that four-fifths of the amount is estimated to be coal.

Worthwhile tonne-kilometre comparisons of growth to date against anticipated movements are not readily available, however, one can gauge rail's performance by tonnes carried on those systems that have already enjoyed the fruits of the mineral boom. Government rail systems carried a total of some 73m tonnes of bulk minerals in 1980/81. Of this, Queensland Railways hauled just on 30m tonnes of coal, an increase in task from 4m tonnes per annum in 1968.

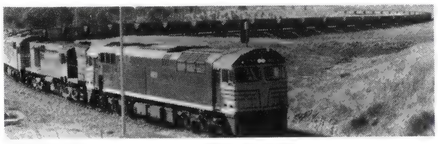
The State Rail Authority of New South Wales' coal volume has grown from 14.3m tonnes in 1968 to 22.3m tonnes in 1981, while the combined iron ore hauls in the Pilbara area of the nation have soared from 10m tonnes in 1968 to 80m tonnes in 1981, and that's down from a peak of 90m tonnes in 1974/75.

The Western Australian Government Railways (Westrail) have experienced an increase in bulk mineral hauls from 1.8m tonnes in 1966 to 13m tonnes in 1981, this increase being largely due to the development of the aluminium industry and the associated movement of bauxite.

Of the privately owned rail systems, those servicing the Pilbara region in Western Australia perform around 95% of the total non government tonne-kilometres rail task, a status which is unlikely to alter to any great extent in the foreseeable future.

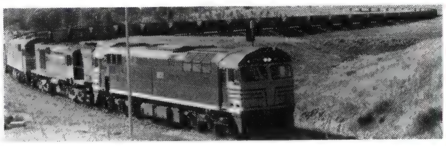
In contrast to the iron ore situation, and regardless of a current depressed market, the export of Australian coal appears to have only just embarked upon a period of spectacular growth given Australia's vast untapped reserves and a worldwide demand for coal that is most unlikely to subside.

If the projections on the growth of coal movement are correct, then it is there that I should concentrate but only after making one or two relevant comparisons between the rail activity of the Pilbara and those of my government rail colleagues in the Eastern States.



Within 10 years of the lifting of iron ore export embargoes in 1960 Australia became the world's leading iron ore exporter. The peak in 1974/75 saw the Pilbara private railways haul over 90 million tonnes of iron ore — almost equal to the total government-operated railway task of that time.

The efficiency with which the private rail carriers expedite the Pilbara iron ore movement is a product of, first, the insight of initially providing high capacity infrastructure and, second, the ready availability of capital to transform that insight into reality.



I suggest, therefore, that the capacity to perform displayed by the private railways of the north west, are prime examples of what can be achieved when capital funds are readily available — this same ability to produce is evident in Queensland where again the railway infrastructure has been made available to railway management without their having to compete with so many other motherhood demands on the public purse.

Having thus divulged my punch line so early in the day let me now revert to the task faced by the Australian railway systems in transporting export coal from mine to port site — let me traverse both the present effort and the future task — the problems we might anticipate and what I consider to be the solutions to those problems.

Need I tell you that Australia's largest and most important export coal deposits are concentrated principally in the Bowen Basin of Eastern Queensland and the Sydney Basin in New South Wales. You of course know that the state owned Queensland Railways service the Bowen Basin while the deposits of the Sydney Basin are served by the State Rail Authority of New South Wales.

What you may not be aware of are the considerable differences which exist between the two systems in their operating methods, their capital financing procedures and their infrastructure dedication, resulting in characteristics and problems endemic to each system, and so I feel there is benefit to be gained from a separate examination of just these two railways.

Whilst there has been a century long association between the New South Wales rail system and the coal industry in that State the more recent dramatic increase in export capacity through New South Wales ports has seen rail-hauled export coal increasing from

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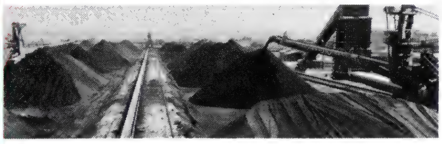
eight million tonnes per annum to 18 million tonnes per annum in only a few years.

Reliable estimates of anticipated growth put expected tonnages on rail in 1985 at between 49 and 64 million tonnes per annum, that is, an increase on the present task of between 170 and 255%. The New South Wales joint Coal Board estimates that by 1990 — only eight years hence tonnages in the order of 85 million tonnes per annum (or a 370% increase on the present level) may be expected.



It is patently obvious then, that the 'marriage' of supply with demand in the export coal industry will only be consumated by the fulfillment of rail's role in transporting the mine product to the sea board.

Which in turn poses the question asked by so many — can the State Rail Authority of New South Wales effectively and capably fulfil this role? Answers have ranged from the qualified "yes" through to the categoric "no".

As I see it the capacity of the SRA to 'deliver the goods', is physically limited by:

- The quality of trackwork (or perway) of the routes over which the coal traffic must move.
- The number and size of trains available to service the export coal trade.
- The capacity of the system to handle more trains, and/or larger trains and/or more frequent train services.
- And perhaps what is paramount as it dictates the answers to previous questions, is the availability of finance to rectify these limitations.

Most lines over which coal is hauled by the SRA were originally constructed as general purpose lines before the advent of the large, unit, bulk train concept. This legacy is probably the greatest determinant reflecting in the SRA's present coal haul operation.

In the past, the permissible size, weight and maximum speed of NSW coal trains has been limited by the standard of yesteryear's track construction: light rail, poor ballasting, steep grades and an insufficient number and length of crossing or passing sidings.

To capably cope with an increased export coal traffic the SRA must not only be in a position to rectify the limitations of the trackwork but also to complement their line with a larger fleet of wagons and locomotives dedicated to the coal traffic.

The SRA as with the rest of the railway industry is very conscious of a problem that could well arise due to an inability by Australia's manufacturing industry to supply future rollingstock demands. The Bureau of Transport Economics has indicated in a recent study that even at 'best' estimates to 1985 there would be effectively no slack between the demand for rail wagons and Australia's manufacturing capacity. Similarly the demand for locomotives over the same period would be close to double the existing manufacturing capacity!

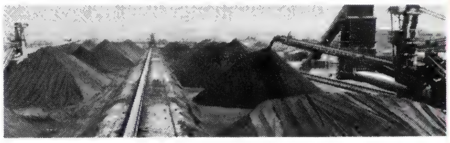
Another problem encountered by the SRA is that most of the routes over which coal is moved are multi-purpose, and in some instances even dense suburban lines, consequently it has been strongly mooted by various bodies that the present capacity on the NSW coal haul routes will be strained to unacceptable levels of congestion, if not before, then certainly soon after the achievement of the forecast 1985 export coal haul tonnages.

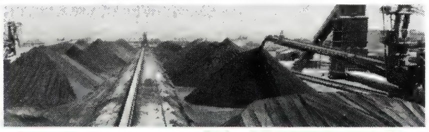
Additionally, the capacity of all growth railway systems to adequately handle the estimated coal tonnages will be dependant upon their ability to provide staff levels suitable for the efficient operation and maintenance of the required infrastructure developments.

In many cases the element of time plays an important role, for example, the applicable NSW engineman's award requires that a trainee engineman undertake four years training before being allowed to independently operate a train. The effect of this substantial 'lead time' being no less significant when it is considered that almost 250 additional enginemen will be required to service the SRA's anticipated 1985 export coal volumes.

If these are the problems and limitations challenging the SRA's capability to service the needs of the inland coal development projects, what then are the solutions?

I understand that the New South Wales government has stated a definitive policy regarding the land transport of coal, a policy aimed at ensuring rail transport of coal for export wherever possible. I'm further informed that at present, SRA investment decisions are given a ranking intended to fulfil that aim. Thus we have, at least, the political vehicle to enable the capable movement of the New South Wales product. But to what extent has this vehicle been put in motion?





New South Wales has recently implemented a $600M capital investment programme earmarked for infrastructure development to handle the State's future coal transport requirements. In the main, the $600M will be spent on:

- upgrading and amplification of existing railway lines
- electrification of certain lines
- the acquisition of large capacity wagons and locomotives
- new terminal facilities at loading and discharge points.

The upgrading and amplification of existing tracks on the major coal haul routes is being concentrated toward the replacement and rehabilitation of track work, lengthening of existing and provision of new sidings and the introduction of new signalling-communication and train control systems.

These developments will effectively enable the SRA to bring the actual capacity of the coal carrying lines up to potential by allowing longer and heavier coal trains to run, to decrease sectional running times and to reduce levels of congestion presently resulting from the shared use of these lines by both coal and non-coal trains.

One of the most obvious and beneficial products of the track upgrading programme is the confirmation and indeed expansion of the bulk train concept in the haulage of coal within the State. Depending on route, coal trains that were delivering approximately 1,300 net tonnes in 1980 are in some cases now hauling up to 3,300 net tonnes, with certain lines anticipated to have maximum net payloads of up to 4,200 tonnes of coal by 1985.

The SRA's programmed acquisition of rollingstock with placing of orders for 450 x 76 tonne high speed coal hopper wagons and 150 higher powered traction improved diesel electric locomotives, though only a part of the total requirement, must nevertheless enhance that system's future capacity to meet the task.

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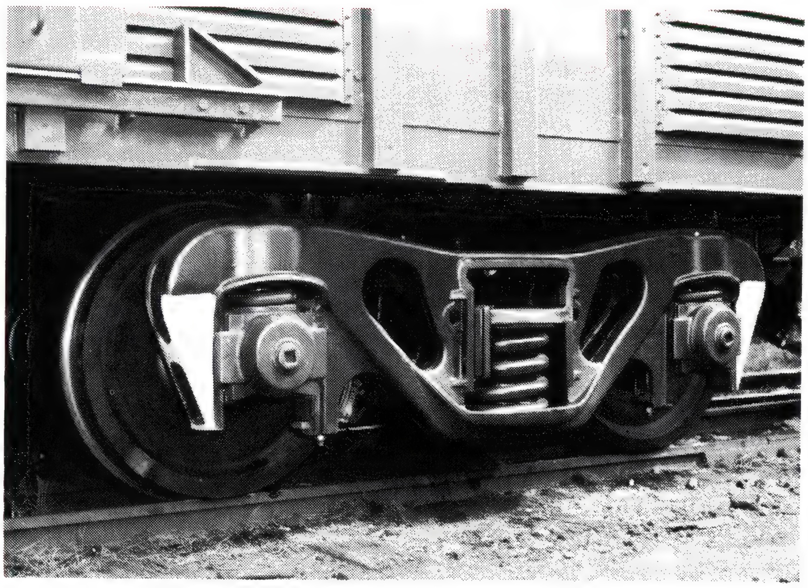
SPRINGS FOR RAILWAY ROLLING STOCK.



Fast freight bogie with Pioneer Springs and Wear Plates as supplied to the New South Wales Public Transport Commission.

PIONEER SPRINGS

Pioneer supplies springs and wear plates for the fast freight bogies and locomotive suspension units that are used to transport goods and passengers over mainline tracks at speeds up to 125 km/hr. Pioneer's reputation for reliability has spread all over the world. Transport engineers everywhere rely on the consistent high quality of Pioneer springs for suspension units.

PIONEER SPRING COMPANY

The Southern Aurora, Sydney-Melbourne Express, fitted with springs supplied by Pioneer.

PN023.FP.

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The ability to run bigger and faster trains is dependent also on the ability of the receiving points to accept our cargos, therefore, the introduction of "balloon loops" which allow for intransit loading and unloading will be vital to rail's capacity to perform.

It seems realistic therefore to acknowledge that the SRA management is competently equipping its system to capably service the land transport needs of the export coal industry to at least 1985. A capability beyond 1985 and onto the end of the century will only be engendered by the continuation and indeed expansion of present infrastructure development programmes.

But again I must emphasise the importance of sufficient capital funds being made available as and when required to equip railway management to meet the growing demands on their service.

Let me now, if I may, turn your attention northward to the Queensland Railways and the dramatic service they have performed to date and the role they anticipate performing in the future logistics task associated with export coal.

The Queensland Railways coal haul which began a little over two decades ago has now grown to be recognised by many as the 'piece-de-resistance' of government railway operations in Australia.

The advent of the 1960s heralded four major factors that essentially explain and underly the efficiency and expediency with which the Queensland railways execute the present coal transport task.

Perhaps even more importantly, these four factors are implicit in diagnosing the disparity between the Queensland and New South Wales coal-haul operations.

First, coal deposits suitable for the export market were discovered in two areas of the Bowen Basin that were not serviced by rail. Secondly, and at approximately the same time, large scale overseas orders were placed for Queensland coal. Third, after several earlier minor coal hauls, it became quickly apparent that there were many inadequacies and limitations in the existing Queensland railway system. Thus, with a supply of suitable and recoverable coal deposits and a ready overseas demand for that coal, the opportunity arose to construct and provide dedicated rail infrastructure from the port sites to these new deposits without carrying over any of the limitations or inhibitions of the existing system.

Complementing the provision of the new dedicated facilities was a programme of upgrading and rehabilitation of the central multi-traffic line which also serviced the Queensland coal fields.

The Queensland Railway's management had been quick to recognise the need for dedicated, high capacity infrastructure and bulk-haul unit coal-train operations which in turn has realised a progression from the earliest steam engine coal train hauling 350 tonnes of coal to the spectacular present day trains utilising technology equal to any in use in the world.

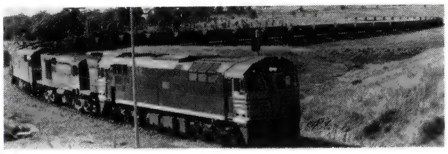
The employment of the American 'locotrol' system is enabling unit trains two kilometres in length with six locomotives — three leading and three unmanned and radio controlled in the middle — to haul trains consisting of 148 wagons and capable of delivering 8,500 tonnes of coal per trip.

Such a dramatic increase in the size of unit coal trains has allowed the Queensland Railways to increase its coal haulage to almost 30 million tonnes in 1981.

The Joint Coal Board has estimated that Queensland black coal exports will be as high as 42 million tonnes per annum by 1985, up to 72 million tonnes per annum by 1990 and even as high as 130 million tonnes per annum by the year 2000.

The fourth, and by far, most outstanding factor facilitating Queensland Railway's exceptionally capable movement of coal is the method of financing adopted to provide coal haul infrastructure.

The Queensland coal industry finances the infrastructure developments which are then constructed, operated and owned by the Queensland Railways.



The coal exporter's investment, a 'security deposit' if you like, is subsequently refunded over an agreed schedule of time and tonnages in the form of freight rebates.

Presuming the continuation of the method of financing infrastructure developments; a lack of any serious obstacles posed by the required improvements, and provided the Queensland authorities have adequate notice and lead time, it is envisaged that this railway system will also have the capability to efficiently service the future land transport needs of the Queensland export coal industry.

I have a simple philosophy on transport: I believe each of the transport modes, road, rail, sea and air, should carry out the role for which they are technically, economically and socially suited.

Having said that I will give a plug to the other systems — even if it is half hearted.

It would seem that the major contenders for the long haul task are the slurry pipeline — the pneumatic capsule pipeline and the conveyor belt system.

I understand that as a result of the experience gained from various world wide applications of all of these systems, each with varying degrees of success, the slurry pipeline is seen to be the most viable alternative to rail as a bulk mineral land transport mode in Australia, especially for the overland movement of coal.

Slurry pipelines are an economically attractive and proven method of transporting minerals — such as iron and copper concentrates etc — that normally involve crushing, grinding and dewatering as part of their processing.

The use of dedicated slurry pipelines for the bulk transport of coal in Australia does appear to have its advantages.

On the other hand, slurry pipelines have a very high initial capital cost and it has been estimated also that the minimum distance over which coal slurry pipelines become cost-competitive with rail is 400km. At present, Australia's major rail coal hauls are at most only three-quarters of this purported 'break even' distance.

Australia's experience over the past twenty years or so clearly indicates that rail transport has a tried and tested capability second to none and while the private sector in the Pilbara has displayed the technical advantage to be gained by doing it properly right from the start — so too have my State colleagues shown that the challenge associated with moving ever growing volumes is by no means insurmountable if funds are made available to provide modern and capable infrastructure.

Safety success for Westrail

Westrail's safety record received a major boost recently when significant safety awards were presented by the Industrial Foundation for Accident Prevention during a presentation ceremony at the Westrail Centre.

"Hats off" to 149 teams from Traffic, Mechanical, Civil Engineering, Motive Power, Signal and Communications and Supply who each achieved a nine month accident free work programme.

A further 40 work areas and depots recorded a 10% or better reduction in lost time injury during the same period.

The Industrial Foundation for Accident Prevention is the industrial wing of the National Safety Council in Western Australia. The Safeway projects were set up by the Foundation to reduce work injuries within industry.

Westrail's Chief Safety Officer, Mr Noel Knight said, "Westrail has always performed creditably in the Safeway project, but this is by far our best performance".

Mr Knight said, "I believe safety has become more readily accepted within Westrail in terms of responsibility and production, both at a senior management level and in the work areas".

The Westrail safety record to the end of May is on an impressive high when compared to the corresponding time last year.

During 1981-82 Westrail recorded 1072 lost time accidents. This is a 20.4% improved performance on the previous year when 1347 lost time accidents were tallied. Working time lost due to work caused injury also fell by 16.5%. This encouraging trend can be further highlighted by the frequency rate which was reduced from 82.2 in 1980-81 to 69.7 this year.

That reduction is even more significant when compared to the performance five years ago when the frequency rate was 103.60.

The Safeway awards come at a time when signficnt achievements have been reached by a number of depots throughout the Westrail system.

Signal and Communications men based at Narrogin achieved 125,000 hours without a lost time accident.

Both the Bunbury and Geraldton Structures division of the Civil Branch have recorded 100,000 hours free of lost time injury.

Fifty motive power men at the Forrestfield Carriage Shed Depot reached 100,000 accident free hours in April.

The most recent award was achieved by Traffic when personnel from the Passenger and Catering Depot for Forrestfield collectively achieved 193,192 hours without a lost time accident.

Supervisory Accident Prevention Courses have been conducted throughout the year as part of an ongoing programme implemented by Westrail to stimulate awareness of safety throughout the rail system.

Congratulations must go to all personnel in work areas concerned and special commendation is due to the dedicated safety officers in all sections of Westrail for their contribution to this improved record.

Westrail has entered 395 teams in the Safeway 82-83 programme. The purpose, to record as many accident free hours over a six month period concluding December 31, 1982.

Heavy lift jacks

Special jacks are being used by the State Rail Authority to lift locos and wagons bodily off their bogies for ease of maintenance at three of their railway workshops throughout New South Wales.

Most recent of these to use the Loc jacks — a product of Sydney-based Sam Technology — is the $9.3 million Bathurst Railway Workshops.

Since then both the Clyde and Goulburn workshops have followed the example by installing the French-developed jacks.

Apart from railways, the jacks are said to be ideal for mining, quarrying, roadworking, dockside and other operations using heavy mobile equipment.

According to the works manager at Bathurst, Mr Alan Cavenagh within 20 minutes of them rolling a wagon into their 144 metre long wagon repair shop, they can have it jacked up over head height, with its bogies removed, using the Loc jacks.

This modern "service station for rail wagons" at Bathurst Railway Workshops measures 144 metres long by 22 metres wide and is equipped with special Loc jacks supplied by Sydney-based Sam Technology for lifting wagons and locos up to 80 tonnes.

Four jacks are provided to lift each wagon or loco. These are mounted on motorised bases that run on rails for quick and easy positioning.

The 3125 square metre Bathurst wagon repair area has two Loc jack sets. One set uses jacks of 10 tonne capacity for a total lift capability of 40 tonnes. The other uses jacks of 20 tonne capacity for an 80 tonne total.

The bigger capacity jacks are used to lift 47 Class and 49 Class branch line locos for underside damage inspection and repair.

Regular preventative maintenance is also carried out using the jacking systems.

In fact, Bathurst is the first workshops to repair freight wagons on a regular 'change-out program', as the SRA term it, involving replacement of all brake gear, inspection of centre castings on which the bogies pivot and repair of draft gear which carries the couplings.

Putting on the RITZ

Luxury travel is again taking to the tracks. In Europe the Orient Express has been revived after a five-year absence, at least in the form of a London to Venice segment of one of the world's most exotic journeys, while a bit closer to home a group of entrepreneurs in association with VicRail, will offer travellers the chance to experience train travel at its very best.

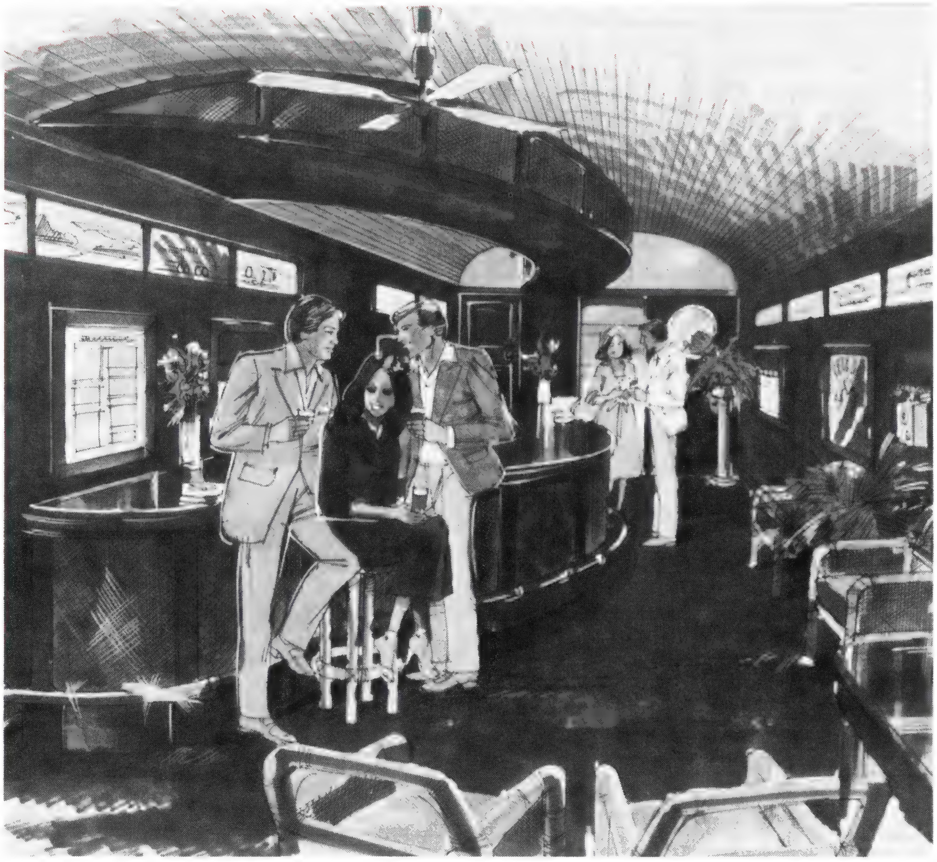
Late next year The Melbourne Limited, a luxury convention excursion train, the enterprise of Tom Binns and four associates, will come into service with an inaugural run to Bendigo.

The train to be hauled by an R Class steam loco, is owned by Steam Age Australia Pty. Limited, a company in which Mr Binns is Managing Director and marks the first time in Victorian railway history that privately owned passenger rolling stock has operated on Government lines.

The company will offer holiday packages to the State's major tourist attractions, as well as providing a unique convention service for those wishing to hold product launches or conferences on wheels.
In this partnership VicRail will provide the crews and track and Steam Age the rolling stock.

An enthusiastic promotor of this his latest venture, film maker Tom Binns says his concept, which required a special amendment to the Railways Act, has taken three years of negotiations with the State Government and VicRail to get off the ground.

Nevertheless he wishes to acknowledge the great support he has received throughout the system for his scheme, as he feels many railway people want to see this type of steam powered luxury on the tracks once more.



● *An artist's impression of the Club Car on The Melbourne Limited, a new luxury convention excursion train.*

Steam Age proposes to obtain two R Class steam engines, chosen because they can sustain high speeds over long distances, and has already purchased Loco R 711 from VicRail, which has since been substituted, thanks to the generosity of the City of Bendigo, with Loco R 766 previously on display in one of the city's parks.

'A chance to experience train travel at its very best'

R 766 is currently undergoing major restoration as are the former 500, 600 and 700 Class steel bodied carriages built in the 30s and 40s and bought from Australian National last year, which "if a bit scruffy on the outside have basically sound interiors".

Inside the cars featuring compartment type seating will be painted in soft tones, which will be offset by existing woodwork, stripped and polished to a new finish. The soft decor will also include pure wool carpets and woven fabric seat coverings and blinds. The dominant colour for the livery will be mid Brunswick green highlighted with cream windows and white roofs.

Mr Binns stresses that The Melbourne Limited will not emulate the nostalgic lines of James Sharwood's Simplon-Orient Express, but assures us that it will offer the same standard of comfort and lushness.

Anxious to dispel any notion that the $1.2 million venture is the whim of a consortium of millionaires, Mr Binns says he and his partners have put their assets on the line and are borrowing to complete the project.
"In no way, shape or form will The Melbourne Limited be in competition with VicRail," Mr Binns says, "Instead we are offering another version of rail travel, which is unique in this country."

Although the final itinerary details have not been worked out yet, excursions are planned for Bendigo, Ballarat, Albury, Wodonga, Swan Hill, Echuca, Warrnambool, as well as major country race meetings.

For VicRail this partnership, in which we provide enginemen, guards and electricians, means not only a chance to see a steam loco once again run in style, but an opportunity to share in the profits of an exciting enterprise.

PICTON PROJECT

By
Peter Wilkinson
M.I.E. Aust.

The control panel at "Picton Signal Control" in the final stages of commissioning.

Since 1976 significant developments in the use of microprocessors have occurred in Westrail. These developments have enabled a group of Engineers in the Signal and Communications Branch to change from the role of interested readers of the relevant literature to active participants in the new technology.

To enable this transition to take place it was fortunate for the group that the managerial climate was receptive to the concept of microprocessor use. In this climate a period of education commenced.

This included improved access to the literature, attendance at seminars and short training sessions held by the trade, the University and the Institute of Technology.

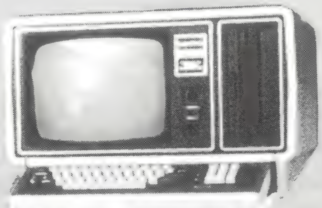
By mid 1977 the stage was set, all that was needed was a suitable project. This paper, in telling the story of that project, outlines the decisions that were made, the problems which arose and some of the pitfalls to be avoided.

The "Picton" Project. From the early 1970s a signalling design philosophy had developed in Westrail. This, simply stated, was that major area signalling schemes would include control panels of the route setting type operated by signalmen. Train controllers or "regulators" where provided would look after the communications role, train scheduling, loading details and similar duties. Schemes in which this philosophy is embodied are: Forrestfield Marshalling Yard and the Midland Control Centre.

The commencement of the wood-chip industry, increasing coal haulage and projected bauxite mining and refinery proposals led to a decision to provide a major signalling scheme centre at Picton in the South West and financial approval was given in January 1977.

On the South West main line from Perth to Bunbury (a major district centre and sea-port) Picton and Brunswick are important rail junctions. Virtually all of the new and proposed loading would pass through one or both of these junctions and along the South West main line.

All early plans for the Control Centre comprehended the design philosophy mentioned previously of a panel worked by signalmen under the control of a Regulator. However in December 1977 a significant change in plans occurred.



The Traffic Branch required that at certain times the whole Control Room to be worked by a single Train Controller. Also that the Controller should be seated and able to attend to recording functions as well as operating the signals.

This policy pointed to a return to a C.T.C. system with "Traffic Master" type control but it was considered that the route complexity, traffic volume and the Controller's other duties would require some improvement to that method of operation.

Accordingly a proposal embodying the following concepts was prepared and submitted to the Chief Traffic Manager for approval.

- That the proposed signalling in the South West area would be controlled by a microcomputer based route-setting system operable by one person.
- That the microcomputer would perform most of the functions normally carried out by non-vital relay logic.
- Operation of the system was to be via a dedicated keyboard/display unit whilst an illuminated diagram would be provided to give the Controller an overview of the controlled area.
- Route setting to be achieved by entering an entrance signal number followed by a function key such as main signal or shunt signal, then a destination place or signal. Pressing an execute key to then cause the route to set and the signal to clear.
- Overall key presses to be minimised by permitting through setting of routes over the entire area and automatic cancellation by train movement would be provided.
- Individual setting of points and switchlock operations would also be achieved from the keyboard.
- The keyboard/display console to provide the operator with easily read, unambiguous messages detailing his entries to the systems, reasons for route unavailability, lists of current routes set and some error messages.

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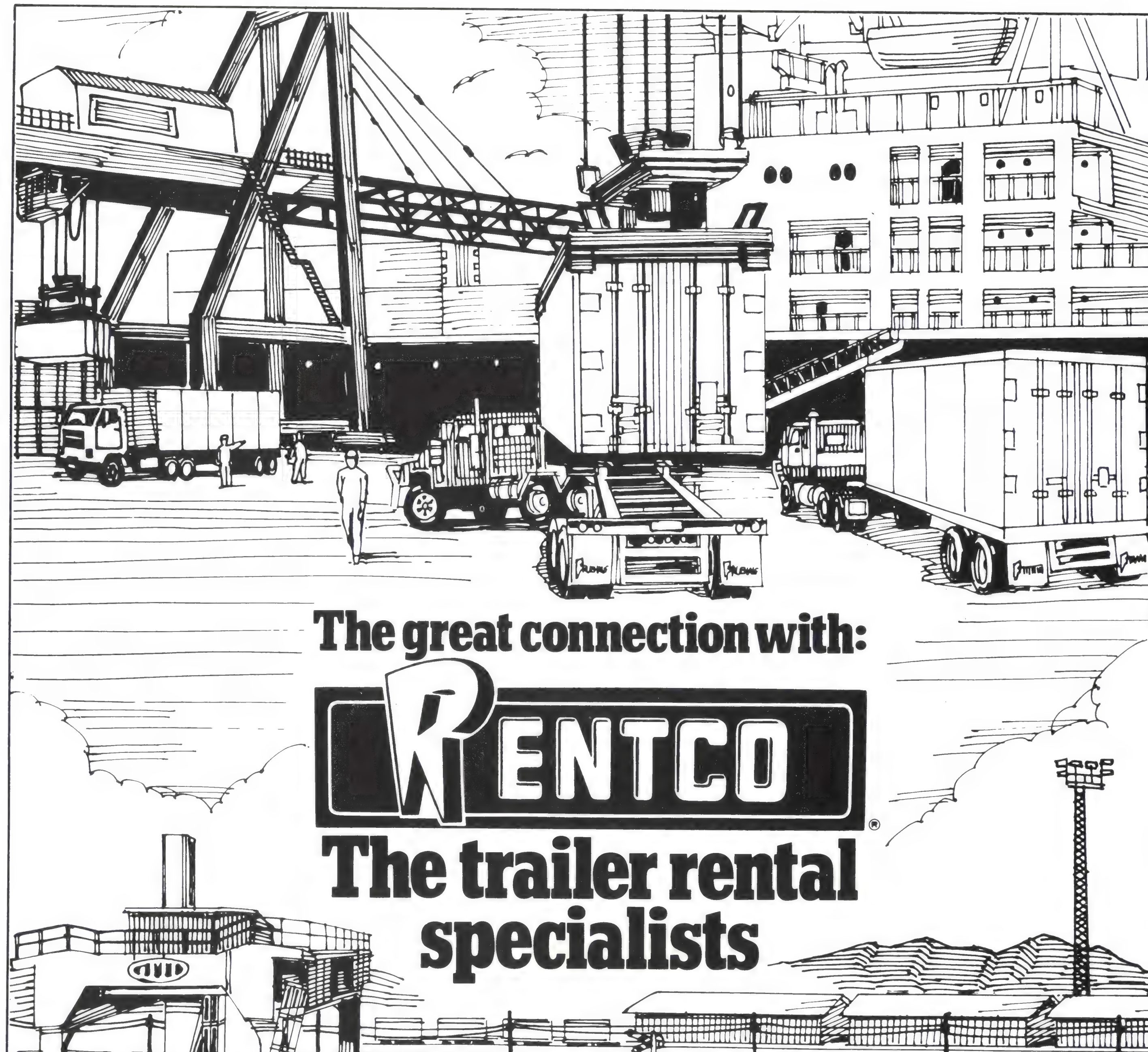
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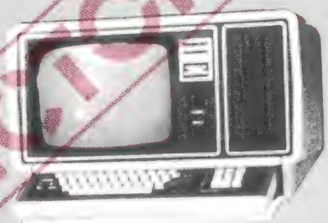
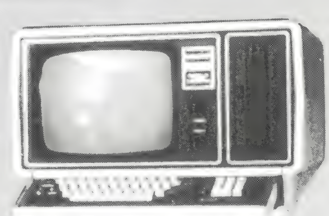
A number of advantages of the proposed system were cited, including, reduced capital cost, much greater ease of operation, adaptability to stagework and the ability to provide some self-diagnosis of faults.
The proposal received favourable attention and formal approval was given in January 1978.



Early design decisions. With approval given, a number of important decisions were made. These were: the type of microprocessor to be used, the type of development system needed and the format of the operators control unit to be provided.
The first decision was relatively easy to make. Most of the experience gained up till that date was related to the 8080 type of microprocessor designed by the Intel Corporation. The 8080 was and remains the nearest thing to an industry standard microprocessor being multi-sourced by a number of major semi-conductor companies.
The decision to use the 8080 was reinforced by the wide availability of support hardware for the chip and particularly the range of Single Board Computers such as the SBC 80/10 and SBC 80/20. The use of such items would clearly reduce the engineering effort required to implement a total system.
The decision as to the type of Development System that would be needed was taken after consideration of a number of options open to the designer of software for a microprocessor based system.
The main choice usually lies between the use of a cross-assembler on an in-house computer or the use of a manufacturers development system.
Such development systems generally provide good editing, assembly and compilation facilities tailored to specific products of the manufacturer concerned.
An alternative to these systems is the use of small computers based on the chosen microprocessor, these frequently provide general purpose high level language computing facilities in addition to the required assembly language programming.
However they may lack some of the advanced features of the dedicated systems such as emulation.
As Westrail had no access to a suitable cross-assembler on its in-house computer, a specification was written for the purchase of a Microprocessor Development System. The system purchased is described below and is of the non-dedicated type.
The format of the operator's console was partially decided by the approval given by the Traffic Branch to the project design concepts.
However the decisions regarding the type of display required still had to be made. Examination of available alpha-numeric displays at the time showed that Burroughs Self-Scan Panels were suitable. These gas discharge display panels are easy to control, relatively cheap, have a good viewing range and are suitable for immediate panel mounting.
An important disadvantage is the need to provide a fairly rigid specification 250 volt d.c. supply in addition to the + 5 Volt and − 12 Volt supplies.

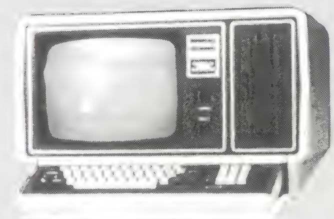
The Microprocessor Development System.

The development system purchased was a Z80 based CROMEMCO Z2 system marketed in W.A. by Australian Computer Products. The hardware comprises C.P.U. and Memory, V.D.U., dual disc drive unit, fast printer, EPROM programmer and U.V. eraser. Disc based software supplied includes: Disc operating system and file manager, editor, absolute and relocating assembler, linking loader, a debug program and an enhanced 16K basic interpreter.
A more recent addition has been a Fortran IV compiler. Figure 2 shows a block diagram of the M.D.S.



C.P.U. and memory. The S100 bus system has a 4MHz Z80A C.P.U. card and 48K bytes of Read/Write RAM memory. The C.P.U. card has a ROM based Monitor program allowing Power-on bootstrap and jump to the CDOS operating system.

Disc drives. The dual 8" floppy disc drives are by PERSCI with voice coil type head movement providing extremely rapid seek times in the order of 33ms. The single density IBM soft sectored 3740 format allows up to 250K bytes of storage per disc. The disc controller card on the S100 bus allows expansion up to four drives.



EPROM Programmer. In common with most one-off or low volume microprocessor systems the Picton software is designed to be resident in U.V. Erasable Programmable Read Only Memories or EPROM. The M.D.S. as presently configured allows for the programming of 2708 (1K x 8 bit) and 2716 (2k x 8 bit) EPROM.

Enclosure. All the foregoing items are held with the necessary power supplies in a desk height timber finish cabinet suitable for a modern office environment.

Visual Display and Keyboard Unit. The V.D.U. has a 30cm diagonal screen displaying up to 24 lines of 80 characters each. The full 128 upper and lower case ASCII character set is displayable with full cursor control, protected fields and dual intensity capability under both keyboard and software control. Communication to the C.P.U. is via an RS232-C link at selectable baud rates up to 19200 thus giving a total screen write in approximately one second.

Printer. To enable hard copy of software to be obtained a Texas 810 printer was provided. Itself microprocessor controlled, the printer offers bi-directional printing of the 128 ASCII character set at up to 150 characters per second.

Software. The disc based software allows for the following facilities:

- Copying from disc to disc or device to device.
- Creation, deletion, renaming and saving of files.
- Outputting a directory listing.
- Formatting of blank discs.
- Loading, executing and debugging of programs.

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Leonora Line Upgraded

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Timber bridges and culverts were replaced with steel and concrete structures.

Between July 1973 and September 1974 the railway was closed and all transport movements, north of Kalgoorlie, were temporarily handled by road.

During the closure larger timber sleepers, 2.5 metres in length, were laid and the existing 29kg/metre rails were re-used.

On September 16, 1974 the standard gauge conversion was completed enabling Westrail to operate 16 tonne axle loads at a maximum speed of 25km/hr. Intermittently since then the upgrading programme has continued while Westrail has operated freight train services.

In June 1978 replacement of the existing ballast with crushed metal, supplied from a railway quarry at Kookynie was begun and was completed two years later.

In more recent times Westrail's upgrading programme has concentrated on rerailing the Kalgoorlie-Leonora link with heavier gauge rail. 47kg/m rail recovered from the Koolyanobbing-Kwinana railway, currently undergoing rehabilitation, has replaced the light rail.

The rerailing was performed by a private contractor Caddy Pty Ltd and reached Leonora on July 4, 1982. Since then Westrail track teams have been thermit welding the rail into continuous length and resurfacing and tamping the track to complete the upgrading work.

Westrail's major freight tonnages over the railway are mineral ores and concentrates and the traffic forecast for the next financial year comprised 150 000 tonnes of nickel, 100 000 tonnes of copper and zinc concentrates as well as 30 000 tonnes of oils and roundly 5 000 tonnes of consolidated general cargo.

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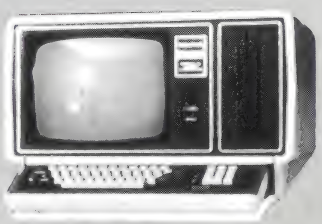
The comprehensive Z80 Assembler provides full macro and conditional assembly and is capable of generating relocatable and absolute object code. Separately assembled modules can be linked into single relocatable object modules. Separate relocations of code, data and stack segments is possible. As the Z80 microprocessor instruction set includes that of the 8080 as a sub-set a decision was made to write all the programs in 8080 code using Z80 memonics. To date this decision has caused no problems.



A sophisticated text editor program allows manipulation and deletion of entire lines of text and of individual characters within a line. Programs can be entered directly from the keyboard, an input port or from disc.

The Project Hardware.

The design philosophy for the project hardware was simple and can be stated thus: Only design and build the items which cannot be procured as complete sub-assemblies from commercial sources. This philosophy was used extensively and greatly reduced the design staff resources needed.
The main microprocessor cubicle contains the following major items:

Single Board Computer System. The Intel System 80/20-4 is a 19 inch rack mountable, packaged microcomputer, the heart of which is the ISBC 80/20-4 Single Board Computer. This card includes an 8080A C.P.U., 4K bytes of static RAM, sockets for 8K bytes of EPROM, a 2K byte Monitor in EPROM, 48 programmable I/O lines, a programmable synchronous or asynchronous RS232-C communications interface, two programmable interval timers and an 8 level vectored priority interrupt structure.

The overall package includes a four slot card cage and mother board, a generously rated power supply and is fan cooled.

The system 80/20-4 has been expanded by the addition of an ISBC 416 16K byte EPROM expansion board and an ISBC 517 combination I/O expansion board. The latter card provides an extra 48 programmable I/O lines and an additional RS232-C communications interface.

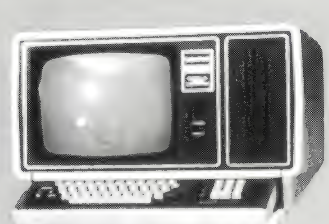
The Input/Output Interfaces. The interfacing of the microprocessor system to the signalling and remote control equipment was analysed and reduced to three specific requirements:

- The need to drive 50 Volt 2000 ohm P.O. 3000 type relays.
- The need to switch a 24 Volt d.c. supply onto the remote control equipment input lines.
- The ability to sense the open or closed condition of various relay contacts.

These requirements were met by designing three interface card types:

TYPE 1 — An Output Interface P.C.B. having 32 optically isolated output stages.
TYPE 2 — A Relay Driver P.C.B. having 32 transistor output stages.
TYPE 3 — An Input Interface P.C.B. having 24 optically isolated input stages.

The Picton project will use four each of Type 1 and Type 2 cards to drive the 128 route and point call relays at Picton itself while an additional five Type 1 cards will drive the 160 remote control equipment inputs. One each of Type 1, 2 and 3 cards are used to scan a matrix of up to 768 relay contacts to provide input information to the system.

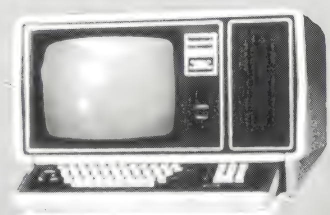


Power Supplies. The main 250 Volt 50Hz power supply feeding the microprocessor equipment is derived from a 500VA inverter fed off the 48 Volt relay room battery supply. In the event of an inverter failure, back-up is from the normal mains supply which has diesel standby. Changeover from inverter to mains is to be manual.

Wiring. Extensive use of flat ribbon cable with up to 50 conductors has greatly reduced the labour content of wiring the equipment and wiring errors and faults are virtually eliminated.

The Operators Console.

Perhaps the most important part of the project from the Traffic Branch point of view is the operator's console. Designed to meet the functional needs of the system at low cost and to be simple and easy to maintain, the console proper is an ergonomically designed commercial package purchased in kit form.



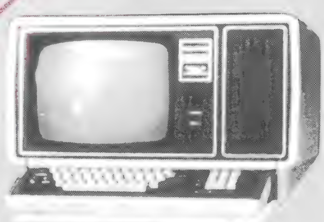
The use of the Intel SBC 80/40 single board computer had a number of advantages over the use of discrete electronics, these were principally cost, versatility and maintainability. The keyboard layout is simple and uncluttered with the 38 keys arranged in functional groups. Internally there are only four items linked by plug and socket connections, these are the keyboard assembly, the computer board and the two display units.
The console power supply unit will be located with the Train Controller desk leaving the console free to be moved to suit the Controllers needs.

Keyboard/Printer. An LA36 Decwriter is to be provided in the relay room. This 30 characters per second printer will be used for data logging, error messages, diagnostic and system interrogation needs.

The Project Software. As in most if not all computer projects the task of creating the necessary software has been difficult and time consuming. Without the aid of the sophisticated development equipment previously described it would have been impossible.

Software Concepts. From the inception of the project the aim was to write modular software which would be largely transportable to similar later projects. The software had to cater for the numerous stages of the project and the uncertainties of the mining world which can initiate or abandon a scheme almost overnight.
To assist in attaining the desired levels of performance the software carries out memory check routines and watchdog programs detect incorrect input

conditions such as simultaneous points normal and reverse detection.
The transportability of the software has been achieved by creating software tables which represent the particular installation i.e. the routes, points and switchlocks. Then by means of interlocking algorithms which remain essentially constant from job to job, the data in the tables can be referenced or manipulated to give the desired result. The tables are generated by a suite of programs written for the purpose in BASIC. This method would have not been possible with the manufacturers development system.



Documentation. To provide the best possible information for maintenance purposes all the software has been well documented. System user manuals are in course of preparation. The task is large but essential. Approximately 3,500 assembly language statements and over 1,000 lines of BASIC code have been written.

Operation of the system.

Operation of the system is very simple and can be divided into three main functions:

(a) Route Setting
- — Key in entrance signal number (1 to 3 digits)
- — Press function key i.e. MAIN SIGNAL TO or SHUNT SIGNAL TO
- — Key in destination place or signal number (1 to 3 digits)
- — Press the EXECUTE key

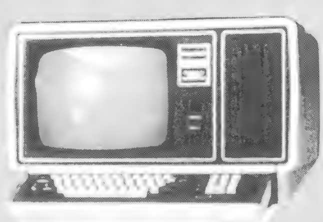
(b) Individual Point Setting
- — Key in point number (3 digits)
- — Press function key i.e. POINTS NORMAL, POINTS REVERSE or POINTS FREE
- — Press the EXECUTE key

(c) Switchlock Operation
- — Key in switchlock number (3 digits)
- — Press function key i.e. SW/LOCK RELEASED or SW/LOCK LOCKED
- — Press the EXECUTE key

Cancellation of a call or route can be achieved by keying in the full sequence again and pressing the CANCEL key in lieu of the execute key or by using the EXAMINE CALLS keys to display the call to be cancelled and then pressing CANCEL or by keying in the signal number, main or shunt functions key followed by CANCEL.

All keyboard entries are subjected to extensive software checking as to validity. If the entry is valid it is echoed in the upper display, if not an error message is displayed. Should a route not be available then the display will show UNAVAILABLE. Pressing the ? key will display an explanation, should there be more than one reason for the unavailability repeated queries will give the additional information.

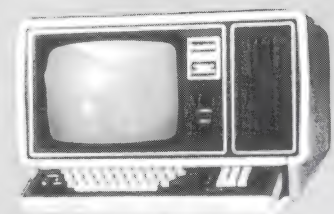
Through setting of routes is possible and encouraged but the present algorithms do not allow a through set route to diverge from the main line to the desired destination. The Examine Calls keys can be used to scroll backwards and forwards through all current commands within the system. Appendix A shows a list of typical messages which can be displayed on the console.



Conclusion. The ultimate measure of success of the microprocessor system for the Picton project will be in its acceptance by the Traffic Branch and its recommendation for further schemes. Whilst some problems will undoubtedly arise, those of us who have been involved are confident of success.

What of the future — already we are heavily committed to another project of a totally different nature. This is the conversion of Westrail's PV6 Matisa Track Recorder Car for computerised track data aquisition and fault reporting. Utilising a minicomputer and several microprocessors the system will provide a significant increase in the efficiency of forecasting track maintenance needs and will be of great value on the Kwinana — Koolyanobbing Rehabilitation Project. Whatever the future holds for railway signalling in this State I am sure that microprocessor technology will play a leading role.

Acknowledgements. The author wishes to thank Mr Adamson the Signal and Communications Engineer for granting permission to prepare and present this paper.
Sincere tribute must be paid to Mr Hennessy for his dedication in implementing the project hardware and software and to Mr Dean and Mr Eaton for their assistance and knowledge.



Appendix A

Typical Console Error Messages

Command string error messages:
1. NON EXISTENT MAIN SIGNAL
2. NON EXISTENT SHUNT SIGNAL
3. NON EXISTENT POINTS
4. NON EXISTENT SWITCHLOCK
5. NON EXISTENT SIGNAL
6. NON EXISTENT DESTINATION SIGNAL
7. NON EXISTENT ROUTE

Further information available on 7.

8. MAY SIGNAL ONLY TO NEXT SIGNAL
9. SHUNT SIGNAL REQUIRED FOR (NECK or YARD)
10. NO SHUNT SIGNAL FROM (signal number) TO (signal number)
11. SIGNALS JUST DON'T CONNECT
12. ROUTE NOT ALLOWED BEYOND (signal number)
13. SAME SOURCE AND DESTINATION SIGNALS.

Availability error messages that occur after the EXECUTE key:

14. UNAVAILABLE

Further information available on 14:

15. (signal number) SHUNT TO (signal number) IS CALLED
16. (SW/lock number) SWITCHLOCK IS RELEASED
17. (points number) POINTS ARE CALLED NORMAL
18. ALREADY CALLED REVERSE

Availability error messages that occur after the CANCEL key:

19. CANNOT CANCEL ROUTE

Further information on 19.

20. SIGNAL IS NOT CALLED
21. (signal number) MAIN TO (signal number) NOT CALLED.

Miscellaneous messages:

22. THERE ARE NO CALLS OF ANY KIND
23. *** EXAMINE CALLS MODE ***
24. SORRY! NO FURTHER INFORMATION.

Crises in city public transport says Janes

Publication of the first edition of Jane's Urban Transport Systems coincides with major crises in city public transport on both sides of the Atlantic according to the publication's editors.

In Britain, they say, a supplementary property tax levied to pay for a low-fares programme designed to entice passengers back to London's bus and Underground services was ruled illegal on the grounds that London Transport (LT) had a statutory duty to try to break even.

After cutting fares by about 30% in October 1981, LT was forced to double them in March 1982 and make plans for reducing service levels. LT's forecasts that the changes would lead to a 20% drop in traffic must be taken seriously in view of the accuracy of its forecast for traffic increase when fares were reduced.

In the United States, Jane's points out, the Reagan administration has announced that urban transport funding will be returned to the states as part of its "New Federalism" and has reduced the fiscal 1983 urban transport budget by $554 million.

It plans to phase out all operating assistance to bus and urban rail services within three years and defer indefinitely any federal funding for construction of new urban rail systems.

Urban transport operators in the United States say the withdrawal of federal operating support will start an uncontrollable spiral of higher fares, reduced services and falling use, the combined impact of which on urban and economic development could be disastrous.

Jane's claims that while subsidies and grants should not be used simply as a buffer against commercial realities or to perpetuate out-of-date working practices and overmanning, a strict and blinkered financial approach to the problem ignores the raison d'etre of city public transport.

The main problems for public transport authorities are that their costs can easily be calculated but their benefits are impossible to quantify financially.

But, to take things to the extreme, according to Jane's most of the world's major cities would asphyxiate themselves physically and economically if they had no public transport system. Insisting on local public transport's being profitable disregards any concept of serving the public.

If public transport is not about serving the public then it has no useful function.

JANE'S URBAN TRANSPORT SYSTEMS 1982
Published in London 13 May 1982, price £42.50, by Jane's Publishing Company Ltd.
Jane's Yearbooks are distributed in the USA and Canada by Science Books International Inc.

What is needed then is first an acceptance at the political level that public transport is the very lifeblood of urban society, and that the benefits provided by even the best organised and best patronised transit systems cannot be financed by fares alone.

Subsidy levels. To be fair, not many governments are totally opposed to paying operating subsidies and even the hardliners in the Reagan administration accept that government has a legitimate role in financing capital projects. The question hinges on what is a fair and just level of subsidy.

London, says Jane's, while doing its case no good by its abysmal productivity record over the years, has a justifiable complaint that it must provide 75% of its operating costs from fares when most other major systems in the world provide only 30 to 50%.

In 1979 New York provided 28% of its operating costs from fares, Milan 29%, Brussels 30%, West Berlin 39%, Paris 44% and Frankfurt, Stuttgart, Munich, Philadelphia, Helsinki and Vienna all about 50%.

The world at large seems to provide the answer to subsidy levels with a broad consensus of 50%.

That, of course, applies only to the Western world. In Eastern Europe and elsewhere public transport systems tend to be given a higher priority than in the West partly because of the much lower percentage of private motor cars on the roads.

As a result they tend to be more comprehensive with bus and rail offering fast, frequent and generally efficient services. Fares are kept low for social reasons.

Jane's points out that the result of a low-fare policy, as London Transport suspected and was beginning to prove, is an intensively used system.

Moscow's metro has less than half the route length of London's yet carries four times as many passengers with journey times up to 40% shorter than by any other available means.

Because of intensive usage the subsidy levels required are not as high as may be supposed. However, on an optimistic note, Jane's indicates that despite the problems in the United States and Britain the world-wide outlook is far from bleak, especially for rail transit, though the high initial cost of building a heavy metro is beginning to swing the pendulum more towards a resurgence of tramways and light rail lines in some cities.

Investment remains high. A recent poll of 64 urban rail systems indicated expenditure in 1982 totalling £3900 million, much of it on new equipment and new lines. In all cases where new systems are being built traffic congestion, energy conservation and pollution considerations are the spur to construction.

New developments include fully-automatic, driverless, computer-controlled systems in operations in Japan and France; automatic guidance for buses being developed in West Germany and magnetic levitation systems being built in Britain (at Birmingham Airport) and developed in Japan, West Germany, Canada and the Soviet Union.

Jane's says in many cities the role of buses is being modified to provide feeder services for metro and light rail systems. In the United States in an increasing number of cities bus transport officials wrestle with the problems of urban traffic congestion by adopting bus lanes to improve lamentably low commercial speeds.

In London the free flow of traffic still remains vulnerable with even small accidents or breakdowns likely to cause chaos over a wide area for hours.

LT says that if its buses could reach the speeds attained on Saturday mornings during the Monday to Friday period it could save £40 million a year, or increase bus frequencies by 15%.

But one thing is certain, claims Jane's, public transport is here to stay, and, in world-wide terms, investment is likely to increase even when economic depression is causing cutbacks in other areas.

Jane's Urban Transport Systems provides information on rail systems in 162 cities and bus systems in 298 cities : their equipment, services and finances.

Manufacturers of vehicles and equipment are covered with illustrated technical and commercial information on products.

trés fast

Passenger boost confirms the

Since September last year, the fastest trains in the world have been running on the French railways (SNCF) in commercial service at the speed of 260km/h (162mph) on a new line forming part of the existing network.

This is the "TGV Paris-South-East", so called because it will gradually be extended to serve all major towns and cities in southeastern France, or 40% of the country's population.

The Paris-South-East axis is one of the main lines of communication in Western Europe. The total traffic (passengers and goods) on the Paris-Lyon line, the "spinal column" of this axis, is the heaviest on the SNCF network. Passenger traffic is constantly growing at a rate higher than SNCF's average.

Already in the last few years, problems had arisen, showing the old Paris-Lyon line had reached its capacity. To cope with this situation, SNCF examined several solutions for modernizing the existing line including quadrupling the double-track sections or electrification and modernization of adjacent lines which might have served as by-pass routes.

These solutions proved to be very expensive, without really improving the passenger service. The line's top speed would still have been 160km/h and it would continue to handle both passenger and goods traffic, making it difficult to adhere to scheduled timetables.

As a result, SNCF came up with a radically new solution, the construction of a new very high speed line, handling passenger traffic exclusively, following the shortest route between Paris and Lyon and adopting gradients of 3.5%, much steeper than on SNCF's conventional lines.

This last point should be stressed since it is one of the most original features of the project and greatly enhances its economic interest. When a line is devoted solely to passenger traffic, trains can be made up of electric multiple units with intensive motorization and high adhesion so that they can climb steep gradients at high speed.

The permissible gradient is, moreover, linked to the maximum speed : the higher the train's speed, the easier it is to take steep gradients; thus, without application of traction, a train running at 260km/h can climb 250m simply by conversion of kinetic energy.

This solution proved to be very economical as it led to a reduction of 30% in construction costs, compared with a conventional line. No tunnels and very few structures were required (0.5% of the length of the line, or 2,100 metres). In open country, the total cost of the line, completely equipped, is less than that of a motorway.

Also, as the new line is technically compatible with convential lines, it uses existing track layouts on the approaches to urban centres.

Another vital characteristic; is the speed of 260km/h. But why run so fast? The answer lies in the economic considerations.

Before, on the old line, the journey from Paris to Lyon took 4 hours, or 3 hours 45 minutes for the best trains. A 200km/h timetable via the new line (the old line, as seen above, could only be taken at 160km/h) gives a running time of 2 hours and a half. At 250km/h, we gain about half an hour compared to 200km/h. At 300km/h we gain only 12 minutes compared to 250km/h.

While the running time declines (but less and less), the air resistance increases similar to the square of the speed. The power drained by the train set, not counting the auxiliaries of the vehicles (lighting, heating, etc.) therefore increases like the cube of the speed.

If we compare the curve of the time gained, which represents, as it were, the economic benefit of the speed, with the curve of the installed power, which shows the contruction costs of the rolling stock and the operating costs, we see that there is an economic optimum for the speed.

According to studies made by the International Union of Railways (UIC) and our own experience, this optimum speed appears to be around 250 to 300km/h.

For these overall reasons, the speed of 260km/h was chosen for the new Paris-Lyon line with a travel time of two hours between these two centres, thanks to 390km of new line and 36km of conventional infrastructure on the approaches to Paris and Lyon. With the new TGV trains, there are substantial time savings on all links between Paris and the Southeast.

The traffic forecast for 1985 on the Paris-South-East rail axis will reach 20 million passengers, or five million more than if the TGV project had not been carried out. This will mean about 50,000 passengers per day, but with sharp weekly peaks. It is emphasized that the new service is accessible to passengers of both 1st and 2nd class for the same fare as now charged for the present Paris-Lyon trip, but with a surcharge for travelling at peak hours.

In the present context of the energy crisis, it is also normal to question the advantage of very high speed from the viewpoint of energy. It happens that the TGV, thanks to its specially designed aerodynamic shape and to the characteristics of the line, consumes per passenger/km at 260km/h hardly more than a conventional fast train, two to three times less than an automobile and five times less than a plane. In addition, the TGV consumes electric energy drained from the national high voltage grid. This is the key reason for the electrification of the new Paris-Lyon line, and also for other electrifications on the French railway network.

By attracting traffic from more costly transport modes (road and air) to the railway, the TGV will, in the final analysis, produce an energy saving of 100,000 tonnes of equivalent petroleum per year.

Fixed installations. On the new TGV line, neither the track nor the rolling stock is a technical revolution, but rather the achievement of the most up-to-date progress realised and, above all, the fruit of 20 years of experiments and testing by the French railways and French industry. The characteristics of the alignment were designed so that trains could run without difficulty at 300km/h.

The line is double track, both tracks being outfitted for two-way working, with crossovers every 25km and stabling sidings every 50 to 70km. It is electrified with 25kV-50Hz alternating current.

The new line is of conventional design with ballasted track. This presents the following decisive advantages over track laid on concrete slabs:

- it is less costly to build (in a ratio of at least 1.5 to 3, if prestressed concrete slabs are used);
- its superelevation can be adjusted if the speed is raised : the line was geometrically designed for 300km/h and, at the outset, is being operated at 260km/h;
- unforeseeable subsidence on embankments can be remedied without very difficult and costly reconstruction works, to say nothing of the risk of damage to the concrete slabs;

continued on page 58

rench TGV 'C'est magnifique'

● The TGV 'at speed' on the new line.
Inset: The driver's cab of the 260 kph train.

continued from page 56

- its geometric quality is adequate, as proven by tests with high speed prototypes, to handle such runs without more costly maintenance;
- it is less noisy.

The rail is of the UIC 60 type, the same as used to equip SNCF's busiest lines. In addition to the above geometric conditions, these rails are especially free of metallurgical defects, and all rails delivered to SNCF are checked by means of ultra-sound. Of course, the rails are welded.

As to the type of electrification, it will be merely indicated here that eight sub-stations equip the 390km of new line, including four at 220kV/50Hz so that energy can be transported at a voltage of 2 x 25kV.

The catenaries are absolutely conventional in structure.

Due to the very high speed in force on the new line, the standard colour-light signals along the tracks have been replaced in favour of coded signals transmitted by rail via "track circuits" about 2,100m long. This type of transmission has the advantage of detecting:

- broken rails without any special device (the signal instructs the driver to stop his train when there is no current in the track);
- presence of a train in the block section.

From the technological viewpoint, the main difference is that the signals are no longer supported on lateral masts, as on conventional lines, but that the rates of speed are displayed in front of the driver in the cab.

The principle of this track-motive power unit transmission is as follows: carrier frequencies are sent out in the rail, but these frequencies must be chosen in a low range 1,700-2,500Hz, frequency-modulated, the possible modulation pulse rates being themselves information carriers.

To operate the line, modulation frequencies have been chosen for the transmission of information, in particular:

- line clear : 260km/h (162mph), 220, 160, 80, 0;
- red screen : absence of information, with running monitored at 35km/h.

These frequencies are received by antennae placed under the front part of the motive power units.

The existence of non-continuous speed monitoring is linked to the choice adopted for driving, i.e. manual, with automated devices designed to supervise, if necessary, the action of the driver and interfering only in case of physical indisposition or failure to comply with the signals.

The rolling stock consists of standard EMUs made up of eight coaches with a motor unit at each end, having a total power of 6,300kW (8,500HP) and carrying 386 passengers, including two-thirds in 2nd class. Two of these trainsets can be coupled together and operated by a single driver. They are dual-voltage : single phase 25kV-50Hz a.c. and 1,500V d.c., since the SNCF Southeastern network includes both systems. Some trainsets can in addition function on 15kV-16⅔Hz single phase a.c. so they can enter Switzerland.

In basic design, these are articulated trainsets, with a bogie between two adjacent bodies.

Many advantages result from this choice:

- fewer bogies, therefore less resistance to forward motion, but also less weight and a less expensive trainset.
- lower slung trainset, which leads to a smaller maximum cross-section than on a conventional vehicle : $8m^2$ compared with $10m^2$.
- lower floor height above the rail, which facilitates passenger access.
- the level of suspension of the bodies may be raised between the bodies, which promotes a low flexibility coefficient. The uncompensated lateral acceleration is limited, for reasons of ride quality, to 0.15g and can therefore handle cant deficiencies of 180mm, thus enabling the TGV trainset to run at higher speeds than ordinary trains on conventional lines.

The maximum cant deficiency on the new line has therefore been set at 130mm for a speed of 300km/h and at 85mm for 260km/h.

Two fundamental original features were thoroughly researched : the pantograph and the bogie, in particular the suspension of the traction motors.

The braking equipment used on the TGV trainsets is as follows:

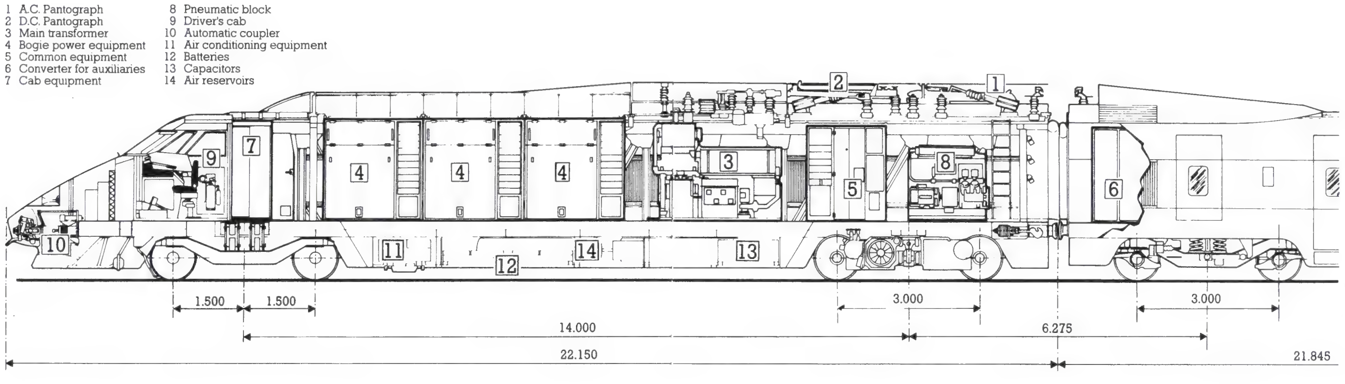
—*rheostatic brake on motor bogies,*
—*disc brakes on carrying bogies (two double discs per axle),*
—*brake with two cast iron shoes on each wheel, applied with an effort of 300daN at high speed and of 1,200daN maximum below 200km/h in case of emergency.*

At present, the southern part of the line, from Saint Florentin to Lyon, has been completed, or two-thirds of the run. The entire line will be in service in October 1983. Commercial operation started on the South section on 27 September 1981.

Out of a total of 97 trainsets ordered from French industry, 55 are in service. The service includes 22 departures from Paris each day of the week, including 13 for Lyon-Saint-Etienne, two for Geneva, three for Dijon-Besancon, four for Marseille-Montpellier, and five extra departures on Fridays. This service will be gradually increased as the trainsets on order are delivered.

In 1983, once the entire line is completely in service, TGVs will serve all the main cities in south-eastern France.

As of now, the average daily traffic of 18,000 passengers has increased by 6,000, of which about 1,500 were captured from air travel. The average seat occupancy coefficient reaches 61%. Train running punctuality is excellent and better than the SNCF average.



Thank you, Mr Van der Bosch

letters

De Meern, Feb. 3, 1982

Sir,
I have read the prospect 'Technology and Australian Railways in AD 2000', published in 'Network', with particular interest. May I be permitted to make some observations on it?
The development of railways in Australia, from the beginning up to the present day, has been marked by inconsistencies in matters of choice of gauge. Although the immense handicap of break-of-gauge is now realised to the full, it is still doubtful whether there is real consciousness of its deeper origins. The political history of the multiple break-of-gauge in Australia may be known in detail, the erroneous ideas that decided to prefer one ga... to another seem... ained ...

mainlines, a figure that is much on par with those practised in Europe or the Soviet Union. Equally in South Africa, the Sishen-Saldanha Bay mineral railway is operated with a normal axle-load of 25 tonnes, allowing 202-wagon trains with a gross trailing load of over 20 000 tonnes, while on the Ermelo-Richard's Bay coal export line profiled wheels will soon permit 26 tonnes per axle without causing undue contactpoint stresses.
Much of this is realised; indeed, the authors of the prospect do state that 'gauge per se does not limit (. . .) axle-load'. What point then can there be in fixing axle-load as a function of gauge?
As for speed, the dynamic behaviour o... vehicles having the usual so... ...r profiled ...s with c...

track gauge and line ca... sense, at least some s... fashionable at the tim... gauge in industrialise... areas and narrow ga... settled country.
Today's locomotive... however, resembl... vehicles of the b... virtually nothing... are no longer a...
Indeed, wher... norm...

Potential of 1067mm gauge

Editor,
Railways of Australia "Network"

Sir,
It was both pleasant and interesting to see the considered comment of your Dutch reader Mr J. A. Van der Bosch on the IE Aust series "Technology and Australian Railways", printed in last year's Network. Pleasant because it is always a pleasure to read better English than most Australian engineers can write, and interesting because the undersigned edited the contributions to which Mr Van der Bosch referred.
I have no disagreement with Mr Van der Bosch's admirable technical summary of the potential of the 1067mm "Cape" rail gauge and the basic irrelevance of gauge to maximum axleload, speed and vehicle dimensions; indeed our review said some of the same things.
I must, however, reassure him and other interested Network readers that the fairly conservative predictions of future speeds and axleloads, particularly in Queensland, were based not on engineering by rule of thumb, or by ignorance of what can be done on the Cape gauge, they reflected a judgement of what, in an imperfect world, is most likely to happen.
QR is Australia's largest system and has, in ascending order of traffic density, essentially three kinds of 1067mm gauge railway

- *many thousands of km of branch and secondary main lines carrying, by European standards, very little traffic indeed. These lines have a track structure based on light rails up to 40 kg/m, a relatively low rail wear rate and hence a long rail life, and an inherited maximum of (roundly) 15t axleload. There is very little money available for upgrading these lines and, as locomotives and railing stock are interchanged, relatively little scope to better 15t @ 105 km/h by the century's turn;*
- *the North Coast main line, laid mostly with 40 kg/m rail and carried on 15t axleload bridges, many of the latter renewed at great cost since World War II (the Brisbane suburban area could be thought of as also lying in this category). Again there is little money for upgrading;*
- *newly-built and upgraded mineral lines laid with 53 and 60 kg/m rail and bridged for today's 19t axleloads. These routes do have the potential for heavier wagons of 20, 23 or 25t axleloads — in time.*

But QR also have another problem, little-known outside Queensland — they have also inherited from the last century vertical (not inclined) rails, and cylindrical-profile (not conical or other more modern developed-profile) wheels.

This inheritance has caused major problems even with the relatively modest axleloads of today's mineral lines and is the subject of on-going research, and programmes to incline rails (done on some newly-laid sections) and plane the rail heads. Wheels will also need to be reprofiled and this, too, is programmed.
However, a railway is a system and no railway issue is more "systematic" in its engineering, or system-wide in its economic implications, than the basic geometry of wheel and rail. When QR have this one licked — and they will — the people who engineered the first 25 kVac urban electrification in Australia, the longest emu coaches on any Cape gauge railway anywhere, and the most ambitious construction and main line electrification plans in the country will be well-placed to apply the economics of higher axleloads, and maximum speeds, on the 1067mm gauge. There is no society of Flat Earth Railroaders north of the Border Loop tunnel — but there are very finite dollar limits to what can be done, where, and how fast. It is the old tradeoff problem of less capital meaning higher operating cost.
Hence the conservative prediction — which we all hope will be proven wrong, for all the right reasons.

Yours faithfully,
Ian Macfarlane
IE Aust National Committee


The clip
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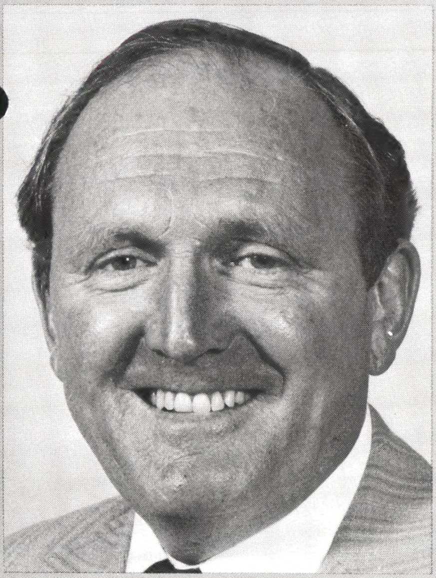

● *Mr L. E. (Lou) Marks*

New ROA Chairman

Mr L. E. (Lou) Marks, Chairman of Australian National, has been appointed Chairman of Railways of Australia.

He succeeds Mr P. J. Goldston, Commissioner of Queensland Railways, who has announced his retirement from Queensland Railways.

Mr Marks became Chairman of Australian National in March of 1981, bringing to the position a wealth of experience in the transport industry.

Following three years in the Navy, he joined Colliers Transport, and by 1955 had become Manager of that company's Queensland operation. In 1956 Colliers was taken over by Mayne Nickless and Lou Marks became Mayne Nickless' Manager for Heavy Transport and Interstate Operations Not long after, he was appointed Manager for Queensland, and later moved to Sydney as Manager for New South Wales.

In 1962 he joined Brambles as Assistant General Manager of the Commercial Transport Division, and became Executive Director of Brambles Holdings Limited in 1971.

He has lectured widely in recent years to both transport and commercial groups, including bi-annual addresses to the Commonwealth Government's Industrial Mobilisation Courses.

His style of lecturing and approach to his subject matter, combined with his ability to get to the crux of the matter and communicate a positive message, have made his addresses memorable.

He has earned a reputation for objective analysis, a strength he has used to advantage in each stage of his highly successful career.

Railways of Australia is indeed fortunate to have a man of the calibre of Mr Marks as its Chairman.

Top transport post goes to Reiher

Victorian Railways Board Chairman, Mr A. S. Reiher has been appointed to the newly created position of Director-General of Transport.

Mr Reiher, who has been Chairman of VicRail since July 1, 1980, will head the Ministry of Transport, which at present is being restructured.

Four new authorities will replace existing transport bodies, such as VicRail, on July 1, 1983. The new authorities are Metropolitan Transit Authority, State Transport Authority, Road Construction Authority and Road Safety and Licensing Authority.

Mr Reiher is responisble for all four authorities. Victoria's Transport Ministry has a budget of $1.5 billion and over 32,000 employees.

Minister of Transport, Mr S. M. Crabb, said Mr Reiher had a proven leadership record and was a keen believer in innovation.

"Mr Reiher's experience will help to ensure that the Government's overhaul of public transport will be carried out efficiently and effectively," said Mr Crabb.

● *Mr A. S. Reiher*

ROA Exec. Chief elected to ATIA Board

Mr Neville J. Gazzard, Executive Director of the Railways of Australia Committee, has been elected to the Honorary Board of the Australian Travel Industry Association (ATIA).

The importance of rail travel to the tourist industry is greater now than ever before, with all members of the travel industry showing greater interest in railways packaged tours and increasing bookings for point to point travel.

The introduction of more XPT services in New South Wales has also stimulated considerable interest in this modern concept of trouble free travel.

Mr Gazzard expects to make a considerable contribution to the ATIA and to the travel industry generally as a result of his election to the ATIA Honorary Board.

The ATIA recently launched its national tourism strategy in Sydney, a co-ordinated plan by the industry for marketing of the Australian tourism product.

● *Examining the new National Tourism Strategy document is Cheryl Beggs of VicRail. (See story above).*

Language centre's success worth talking about

The Language Resource Centre opened at the State Rail Authority's Air-Conditioned Depot (ACDEP) at Alexandria has been well received by employees.

The Authority's Chief Executive, Mr David Hill, said many staff members have taken the opportunity to improve their knowledge of English by attending these courses.

The aim of the programme is to provide employees with the language skills needed to communicate effectively in the workplace.

The State Rail Authority has now started a multilingual programme for supervisors at ACDEP.

Mr Hill said that cleaning supervisors are attending the course, which includes role clarification; planning and organising; staff control; communication techniques and interviewing; use of interpreters; and industrial relations.

The State Rail Authority believes that this is the first time in Australia such a course has been developed specifically for presentation in the various community languages.

This initiative highlights the Authority's desire to develop its most important resource — people — regardless of ethnic origin or sex.

Former railway ministers meet

Five former Queensland Railway Ministers attended a dinner hosted by Transport Minister, Don Lane for now retired Deputy Commissioner and Secretary, Jack Neeson (fourth from left).

They were (from left): Don Lane (1980-); Sir William Knox, M.L.A. (1965-72); Ken Tomkins, M.L.A. (1977-1980); Treasurer, Dr Llew Edwards, M.L.A., (who has acted as Minister); Tom Moores (1957); Sir Gordon Chalk (1957-65) and Fred Campbell (1977).

Only Ministers in the last 35 years missing were Jack Duggan (1947-57) and the late Keith Hooper.

New task for 'Siggi'

Commissioners of the Railways of Australia have appointed Mr S. Johr to the position of Assistant Director, Railways of Australia Committee (Intersystem Traffic Control).

Mr Johr succeeds Mr J. E. Kennedy, who has retired after 44 years' service with Victorian Railways, the past four years having been spent in the CENWAG operation.

Mr S. "Siggi" Johr is no stranger to CENWAG as he was Assistant Manager of the section in 1980, returning to Australian National in 1981 to become Superintendent Transportation (Central Region). In 1981 he became Acting Operations Superintendent and Operations Manager, and was appointed Assistant Operations Manager (South) in July 1981.

● *Mr S. "Siggi" Johr*

● *Mr J. E. Kennedy*

Mr Johr's track record is an interesting one. He came to Australia in December of 1951 planning to stay for, perhaps, two years in a new and interesting land. Although the spirit of adventure has not ever left him, his temporary stay in Australia has been extended from the original two year plan to 31 years, and "Siggi" confesses it was many years ago when he made Australia his home. As he says, "I fell in love with Australia and its people," a feeling which has never left him.

"Siggi" is married with three grown up children.

Of his life in the railways, Jim Kennedy is unusually reticent. Fourty-four years is a long time, and Jim has accomplished a great deal in that time. He joined VicRail as a Junior Clerk in 1938, serving at 25 stations before coming to Head Office in 1965.

In 1969, when overseas container traffic started in earnest he was given the task of controlling VicRail's container operations. He recalls this period as most challenging but rewarding because of the many friends he made in the shipping industry.

The experience gained resulted in him representing VicRail on the Port of Melbourne Cargo Facilitation Committee for five years. He became Superintendent of Freight Train Running in 1973, and Assistant Manager, Wagon Operations in 1977.

In 1978 he was assigned to the task of introducing "through working" of trains between Victoria and New South Wales, and has represented VicRail on many task forces and in conference situations.

The evolution of CENWAG as we know it today is a fine tribute to Jim Kennedy's dedication, enthusiasm and knowledge of operations.

Staff of all Systems will wish "Jim" Kennedy every success on his retirement.

Australians buy big into Amtrak

Reporting a 37 percent increase in international sales bookings this year over the same period in 1981, Amtrak Vice President-Sales Mr Jim Callery has announced a further step-up of international sales efforts.

In reporting the increase of international sales through August 1, this year, Amtrak's international reservations office said England continues to lead as the No. 1 overseas source of Amtrak passengers but that the biggest recent surge of business has come from Japan, Australia and New Zealand. Australia is now No. 2.

To create an additional overseas awareness of its equipment and services, Amtrak increased its participation in the Discover America International Pow Wow, September 11-15 at Las Vegas, Nevada.

Staged by the Travel Industry Association of America and the U.S. Travel & Tourism Administration, this annual event attracted some 1000 tour operators and journalists from overseas to meet with U.S. travel industry personnel.

Amtrak sponsored an "Early Bird Reception" and displayed newest equipment at its Las Vegas station on September 11, the first day of the Pow Wow. Amtrak also invited many of the participants to ride its Superliner-equipped train, The Desert Wind, from Los Angeles to Las Vegas.

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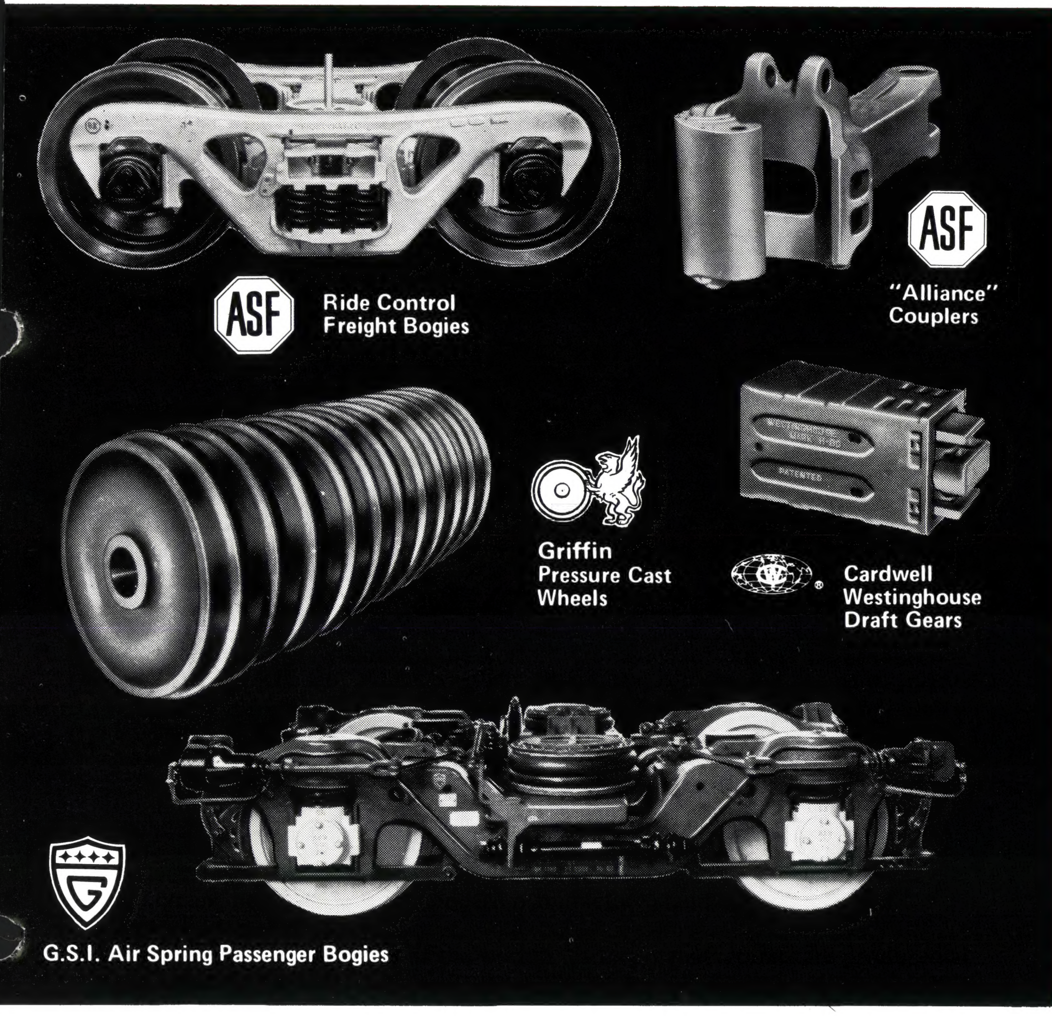

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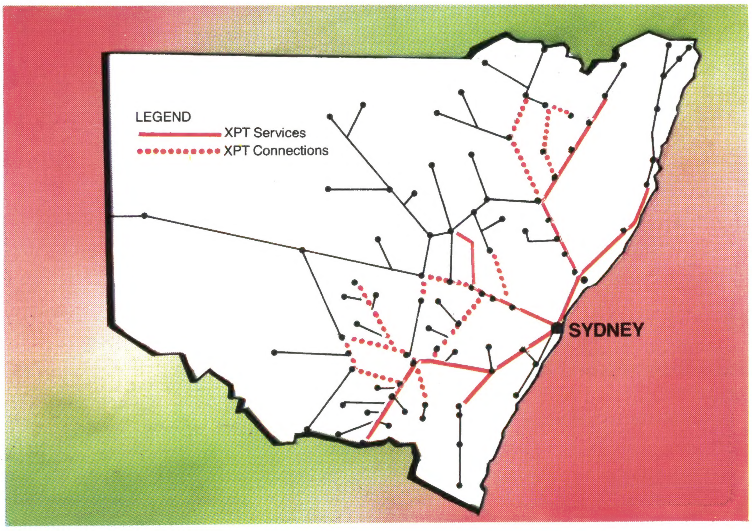

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